VOLUME XXII NUMBER NINE

THE NATIONAL GEOGRAPHIC MAGAZINE

SEPTEMBER, 1911

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Illustrated

PUBLISHED BY THE
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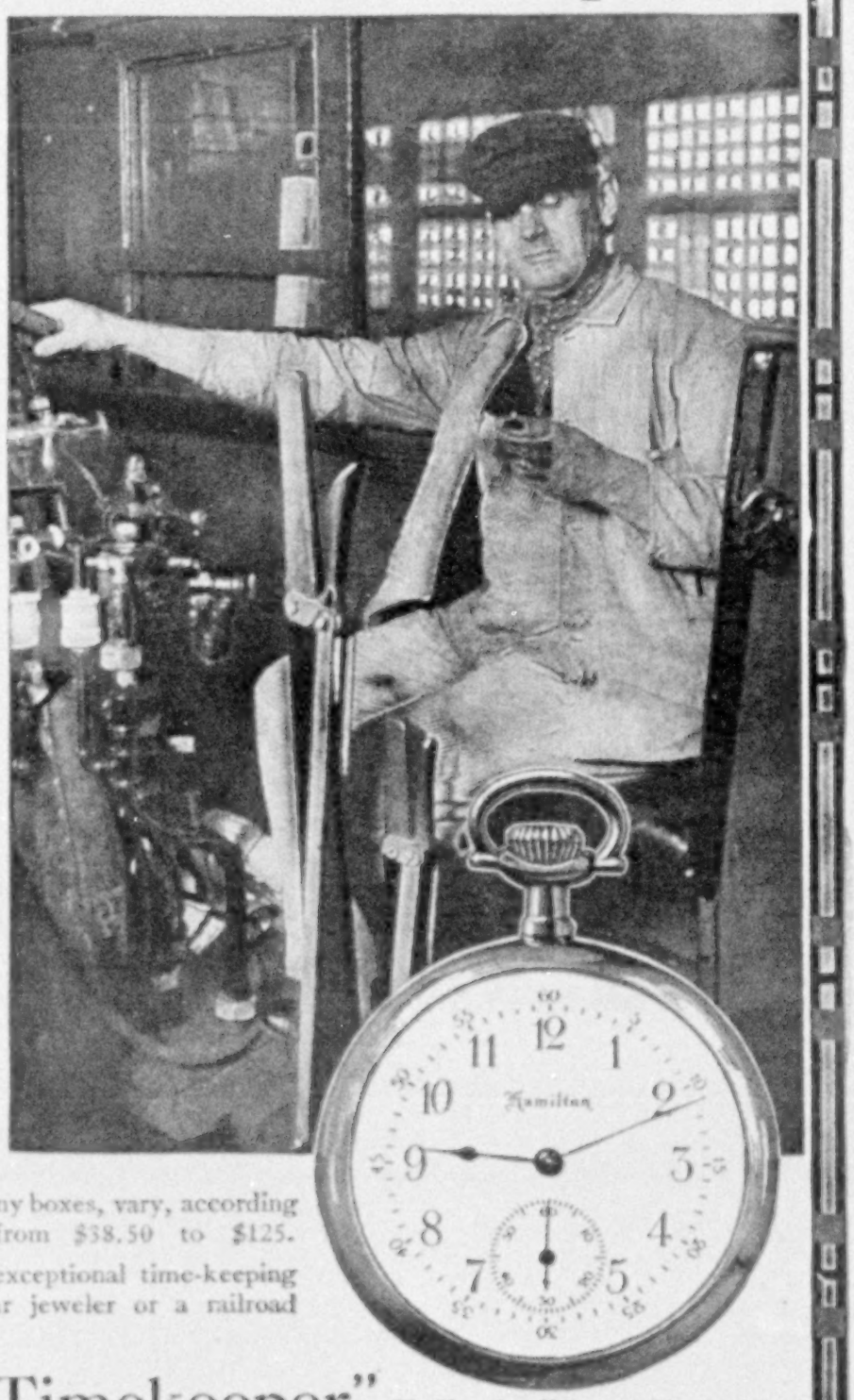

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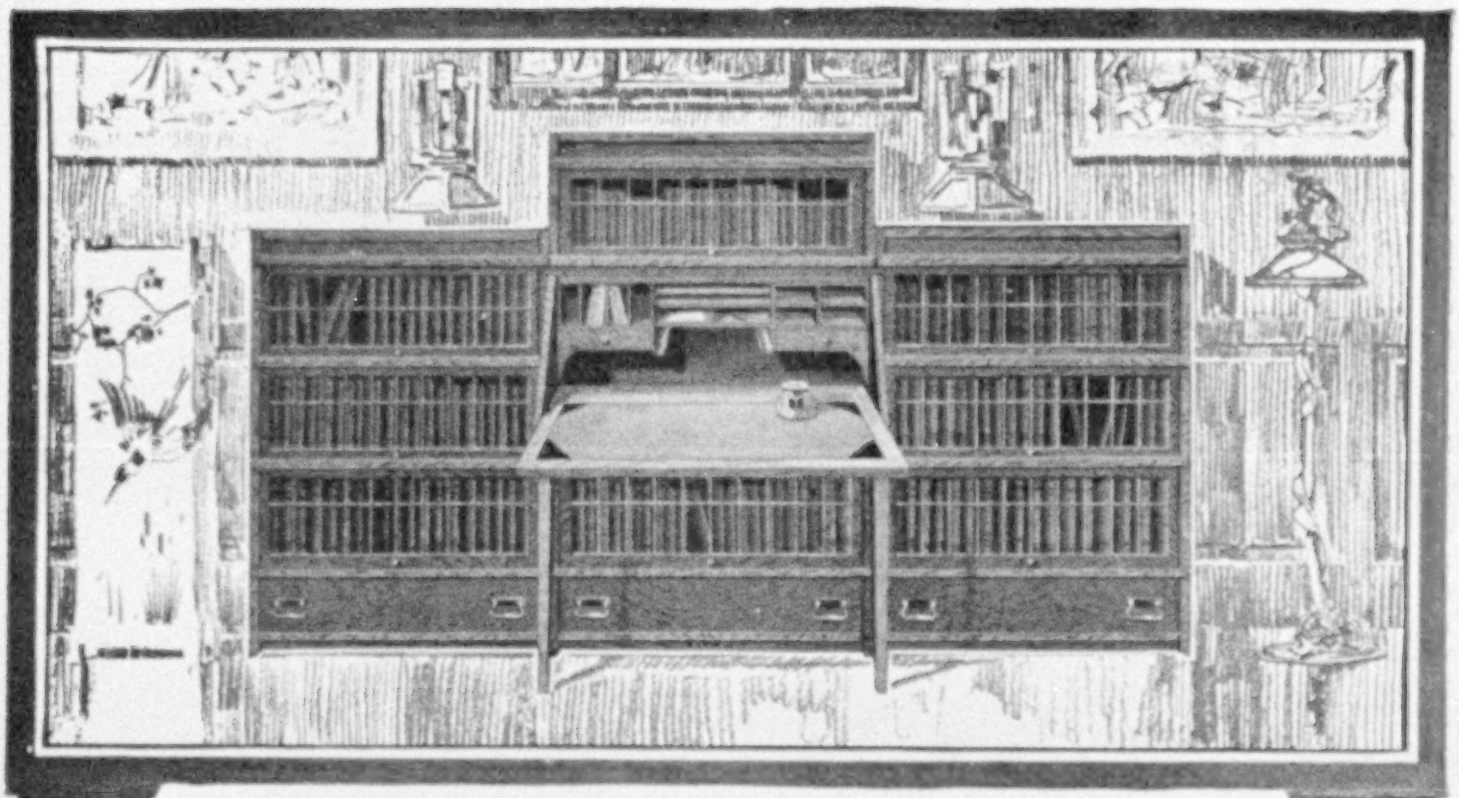

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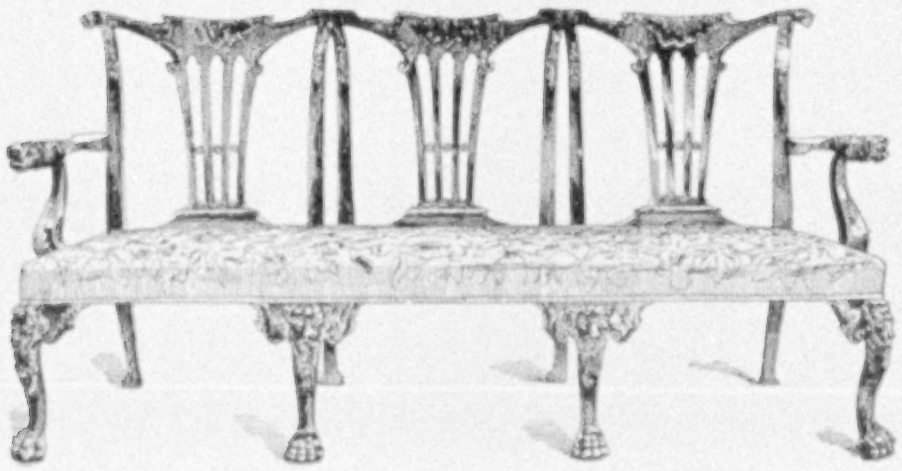

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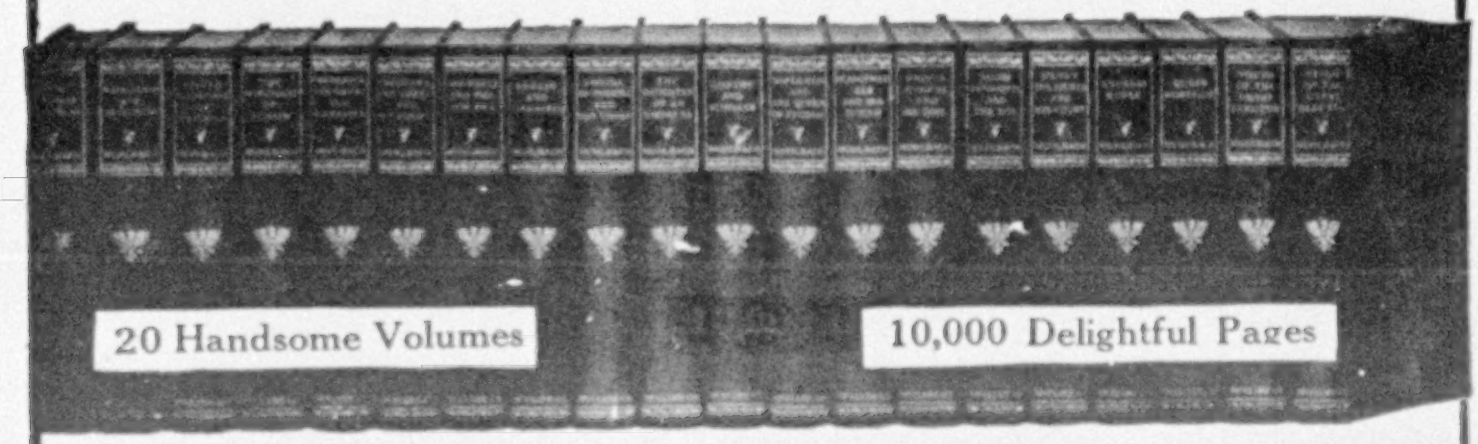

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VOL. XXII, No. 9 WASHINGTON SEPTEMBER, 1911

THE NATIONAL GEOGRAPHIC MAGAZINE

THE MOLE MEN: AN ACCOUNT OF THE TROGLODYTES OF SOUTHERN TUNISIA

BY FRANK EDWARD JOHNSON

WHEN the cadi's letter reached me in Norwich, Connecticut, early last December, I little realized what I was to see on accepting his kind invitation to come and visit him at Foum Tatahouine, in the extreme southern part of Tunisia. He wrote, "What you have said in your lectures about the Troglodytes is very true and interesting, but you have not seen the highest types of our mountaineers. I myself own one of these mountain caves, and my pleasure is great when I can flee away from the noise and complaints of my tribunal and seek the quiet of my Troglodyte home, which is warm in winter and cool in summer."

The cadi and I had become firm friends during a trip to Tripoli, of Barbary, in the spring of 1910. The boundary between Tripoli and Tunisia was being settled, and the cadi was one of the commissioners sent by the French government. He is a full-blooded Troglodyte.

In certain parts of Tripoli Jews dwell in caves and holes in the earth, but they are not the original Troglodytes and do not date back many centuries.

In the island of Grand Canary there are colonies of cave-dwellers living in caves dug in the cliffs; they are descendants of the Guanchos, and they are fierce and curious. I rode out on horseback to see them. Again, in France and Spain there are people that live in caves. To my great surprise I found that in Washington, D. C., they call the old families in certain streets cave-dwellers, and they were so charming that it was with great difficulty that I tore myself away to start off on my long journey to Tunisia en route to study the Troglodytes of extreme southern Tunisia.

The steamers of the Compagnie Tonache sail once a week (Fridays) from Tunis for Tripoli, of Barbary, and intermediate ports; so one Friday night about 8 o'clock we steamed slowly down the canal from Tunis to La Goulette and around Cape Bon on the good ship *Djurjura*. My welcome on board was a warm one, for the last time I traveled on that steamer was after the attack on me in the streets of Tripoli, and every one, from the captain down to the cabin boy, was most kind and attentive. The captains of this line are well-read, entertaining men and excellent seamen.

About 6 o'clock Saturday morning we dropped anchor in the quaint little town of Sousse, known as Hadremuntum in the days of Rome. The Arab town is well worth a visit, and so are the cata-

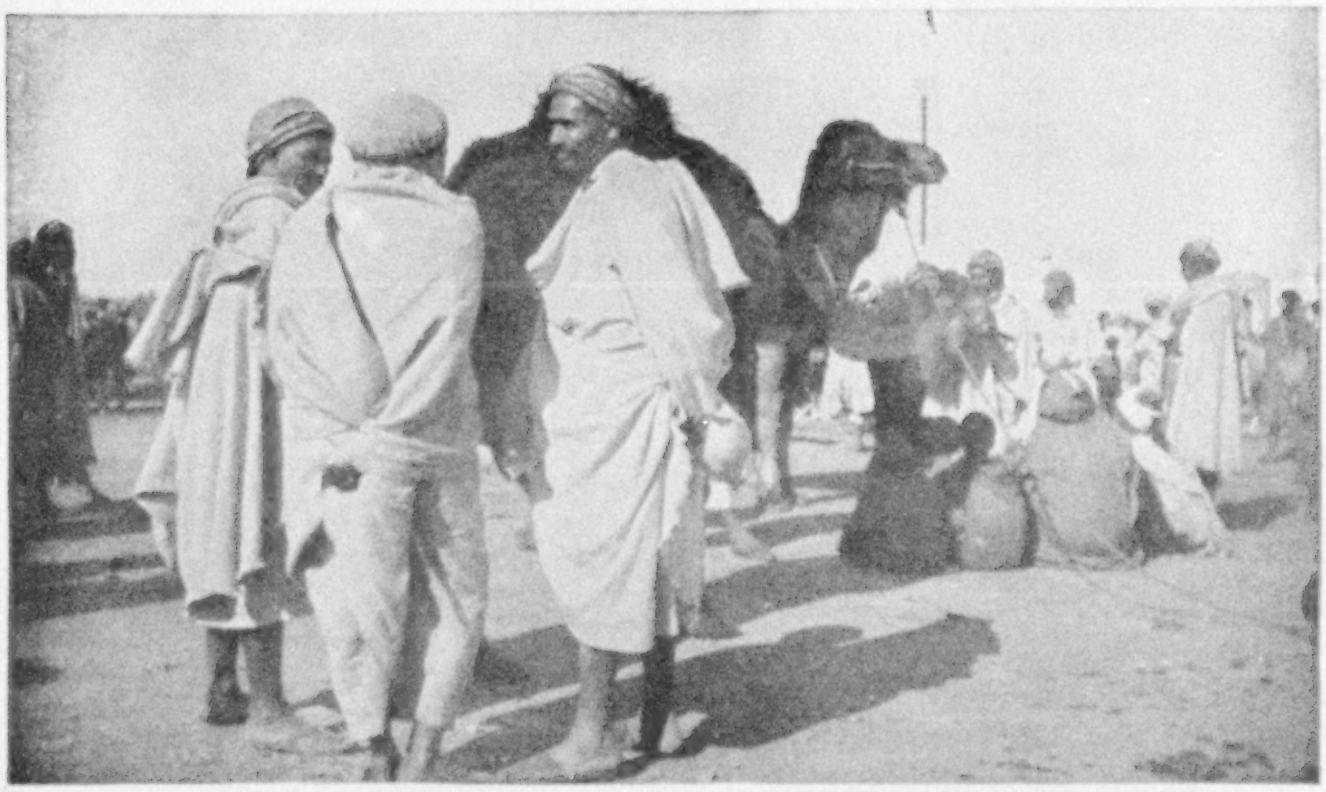

Photo by Marie Helms

SCENES FROM THE WEEKLY FAIR IN A SMALL VILLAGE: TUNISIA

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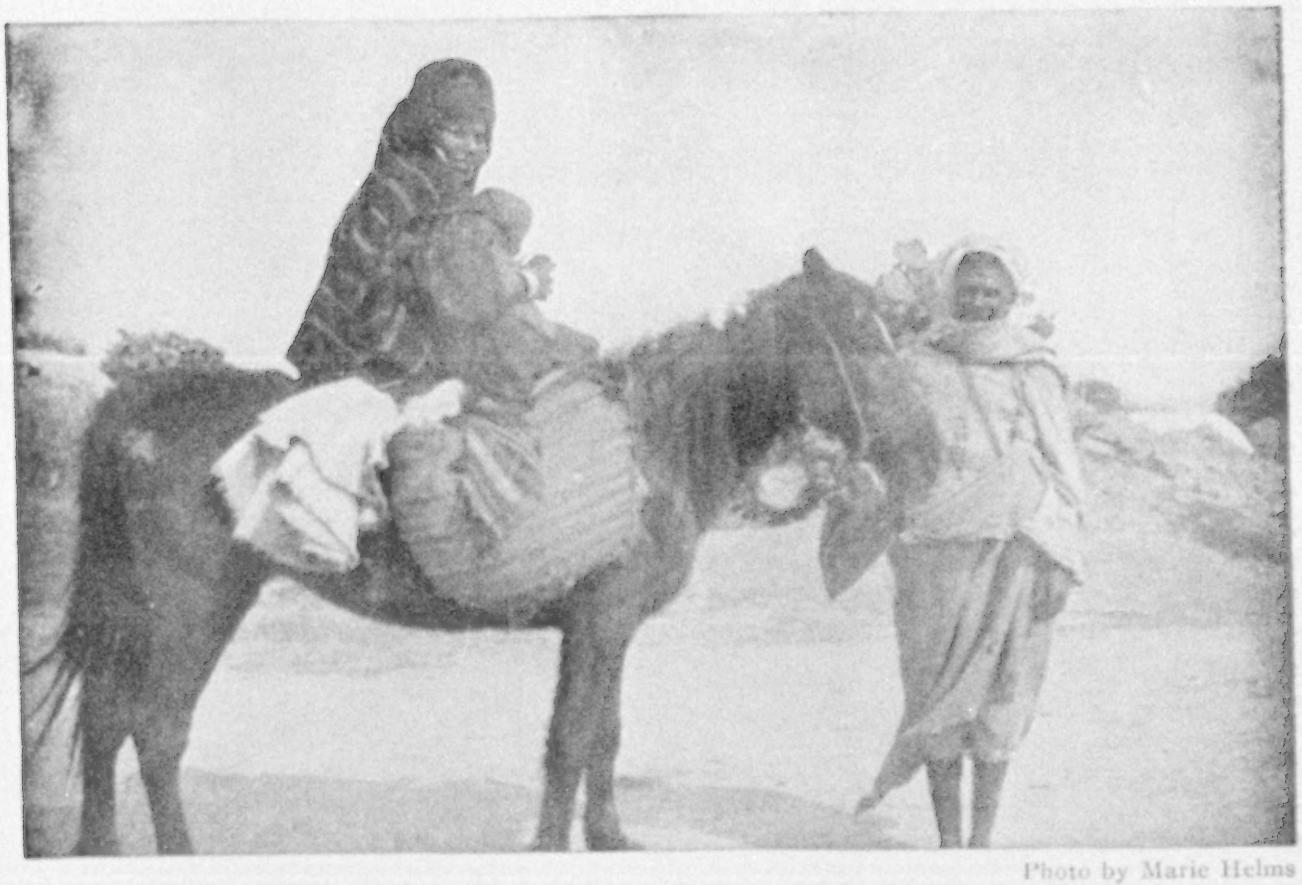
ARABIAN TYPES: TUNISIA



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BEDOUINS COMING TO THE WEEKLY FAIR

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BREAD-SELLERS: TUNISIA

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AT THE POTTERY-MAKER'S: KNEADING THE CLAY BY TREADING UPON IT

combs and the small but interesting museum of Roman and Phœnician antiquities—mosaics, lamps, pottery, and coins.

One o'clock comes all too soon, and the *Djurjura* sails on the minute. Just before sunset we come into Mahdia, where the wonderful Greek bronzes were fished out of the Mediterranean after remaining hidden for over 2,000 years.

THE PORT OF OLIVES

After sending ashore some mail and unloading a few tons of cargo, we proceed and enter the harbor of Sfax about 9 a. m. Sunday. Sfax is a hustling little town with a lot of business. It is the center of the cultivation of olives for olive oil and the port for shipping phosphates from the mines above Gafsa, and quantities of esparto-grass are shipped from here to England to be made into paper. Great caravans of camels arrive almost daily loaded with bundles of esparto-grass weighing about 300 kilograms each.

The great olive orchards—forests, one might say—are worth driving or motoring out to see at Toual-el-Cheridi, and the government sponge fisheries are worthy of an article to themselves.

Here in the clear, shallow water of the Mediterranean, about a kilometer outside the harbor of Sfax, is situated a small biological laboratory for the scientific study of sponges. It is unique in the world. Here they watch the development from the tiny larva, so small that it can only be studied under a microscope, until five years later it has developed into a perfect sponge—a sponge that in the markets of the world fetches the highest price. They do not tear and are fine. Diseases of the sponge are studied and records of each sponge kept on file. Of the Greek sponge fisheries and divers we must pass over. Only be sure and take a walk through the Arab town and see the souks. They are smaller than those of Tunis, but the Oriental mass of color cannot be described.

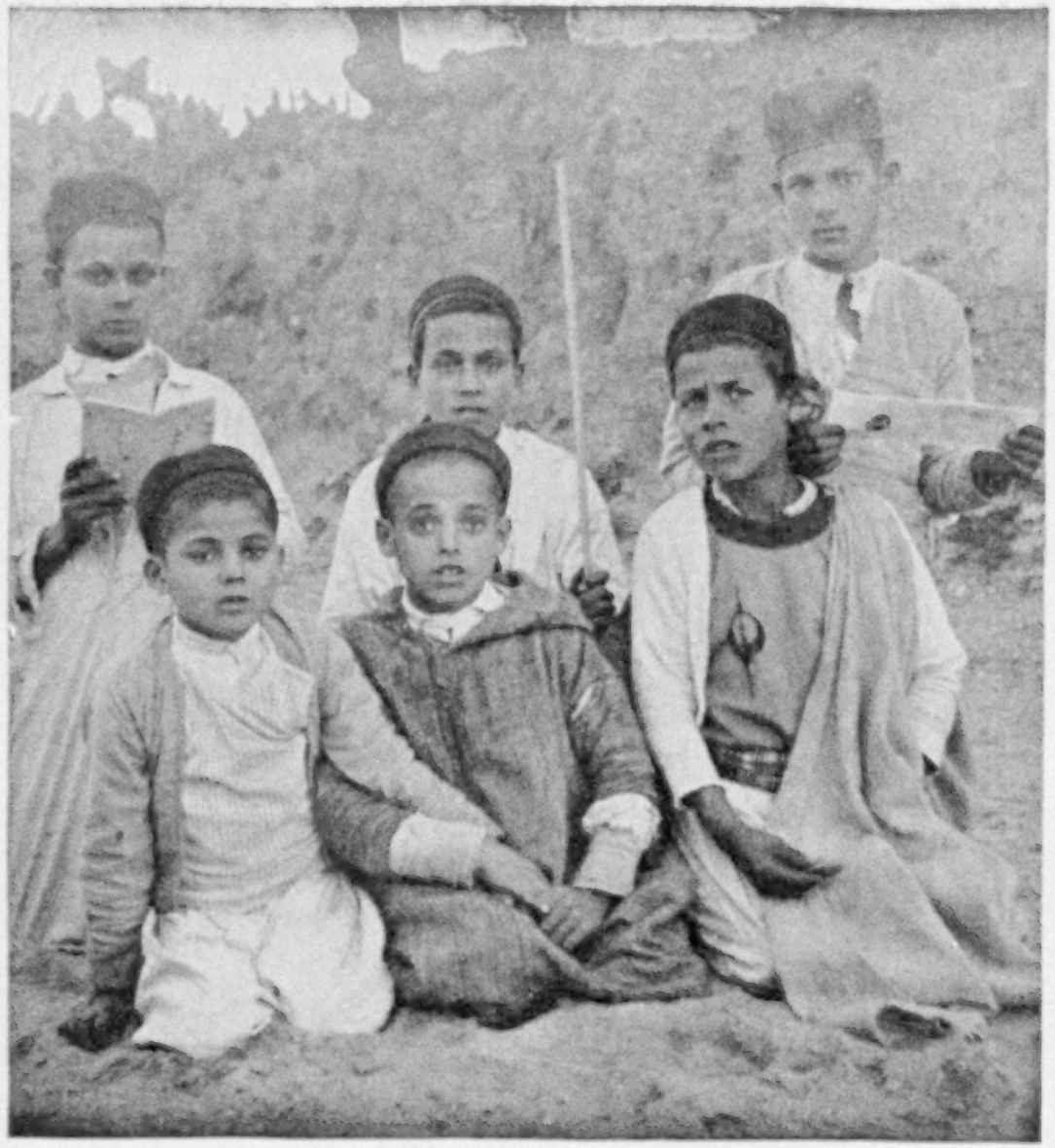
Gabes is a small French town with three large oases of superb palm trees and fertile gardens. Landing in small boats from the steamer is not easy when the sea is rough.

Photo by Marie Helms

THE POTTERY WHICH IS THE MAIN INDUSTRY OF NABEUL, A SMALL ARABIAN TOWN ON CAPE BON, A THREE-HOUR RAILWAY JOURNEY FROM TUNIS

Gabes is a garrison town, and the "Bataillon d'Afrique" is stationed here. Any soldier having served a term in prison twice, for theft, fighting, desertion, or such causes, is sent, after serving his sentence in prison, to finish his military service at Gabes.

One cannot think of Gabes without Marius, the fat, jolly hotel keeper, a true provincial of southern France, and his good wife, Madame Marie. They have lived at Gabes 26 years and know all about the country. "L'ami Marius" is a character known all over Europe; also



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ARABIAN BOYS OF TUNISIA

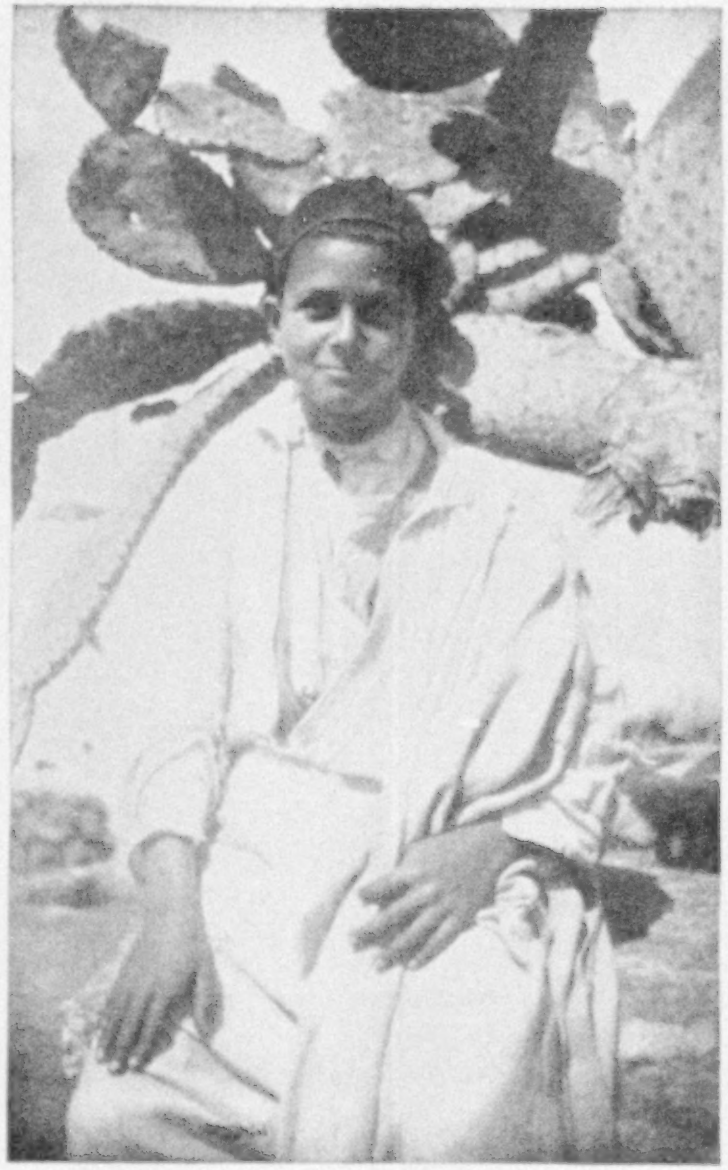


Photo by Marie Helms

A HANDSOME ARABIAN BOY: TUNISIA

Photo by Genet

LANDING FROM THE STEAMER AT GABES IN ROUGH WEATHER

his wit, table, and hospitality. Fortunate is the traveler that falls into his good graces.

THE CAVE CITY

Imagine arriving at a town of 5,000 inhabitants and not seeing one house—only a picturesque mosque, built since the French occupation. Matmata is the chief town of the caidship of Matmata, which covers quite a large area and comprises the villages of Tamezred, Zeraona, Benioussa, Toudjane, Benizelten, and Hadidji. All told there are about 20,000 souls living in this district, which is situated 45 kilometers south of Gabes. All of them are Troglodytes.

At Matmata, Benioussa, Benizelten, and Hadidji the inhabitants live in caves dug in the earth (see pages 812 and 813).

The holes vary in depth and width, but average 9 meters deep by 15 meters in circumference. This great hole, shown on page 818, is used as a "patio," or courtyard. Numerous caves dug in the sides of the hole serve as living-rooms and storehouses. One enters these dwellings by means of a passage tunneled through the earth or rock. Some of the ceilings are roughly ornamented with Arabic designs cut in bas-relief in the rock and the dates when the dwellings were dug. None of them seem to go back more than 100 years and many are not as old, proving my statement that all Troglodytes were originally "climbing Troglodytes," dwelling in caves on the tops of the highest mountain peaks.

Walking through the passage into the large circular courtyard open to the sky, one sees large caves cut into the walls of the tunnel that serve for storehouses and granaries. (Grain will keep here for years in perfect condition.) There are also caves for the goats, sheep, and donkeys. A square masonry trough pipes the rain water into a large cistern built in the center of the courtyard. It rains very little, but when it rains it pours, and every drop of water is carefully preserved—so carefully that horses and ani-

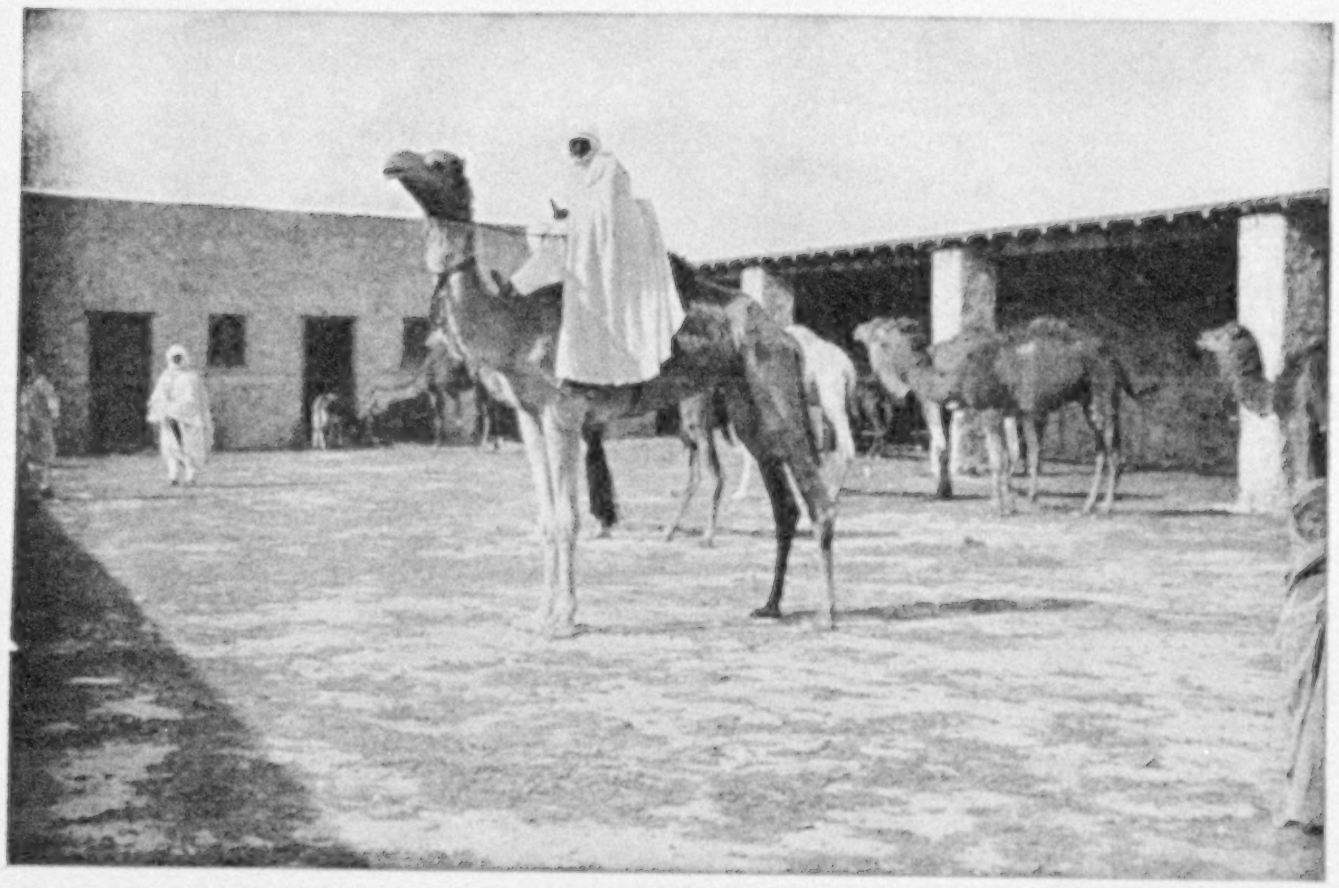


Photo by Genet

RACING CAMEL FROM GHADAMES: IT STANDS ABOUT 3 METERS (9.84 FEET) HIGH

mals are watered only once in every 24 hours, and then not all they want.

The inhabitants of Matmata cultivate olive trees. There are 60,000 trees in the district, but the oil is rather a poor quality, owing to the crude method of making it.

On the drive from Gabes to Matmata we passed fields of barley and some wheat, the ears of which turn black when ripe. There is no wood except the olive trees, and the inhabitants of all this part of the country use dried camel dung for fuel.

THE LORD OF THE DISTRICT

The Caid of Matmata is a very intelligent Arab, who had been caid at Matmata for about one month. For years he had been caliph at Zarzis, a pretty little French town on the coast, and the change to Matmata must have been an unwelcome one in spite of his advancement from caliph to caid. His dwelling was a Matmata Troglodyte hole, the entrance and walls of which were whitewashed, and in some of his cave-rooms he had installed European furniture. The description of one dwelling answers for all; so let us take that of Sheik Ferdjani, of the tribe of Achéches. His home is a large and typical one (see pictures, pages 817, 818, 819).

THE HOME OF A SHEIK

Matmata has a special code of etiquette. Never approach near enough to another man's dwelling to look down into the great circular courtyard and see his women. It is not only bad form, but it is dangerous. Each dwelling has numbers of white Kabyle dogs that keep a constant watch, and on your approach would fly at you and like to tear you into pieces. Never enter a passageway to a dwelling without sending in a small boy or girl to let the women know that you are coming.

Sheik Ferdjani asks us to enter. A young man burns a handful of dried esparto-grass, which flames up brightly and shows us the steps and turns down the tunnel. I almost fell over a donkey eating its hay. Great eyes glared at me from out of the blackness. On coming into the large, round courtyard one

Photo by Lehnert & Landrock

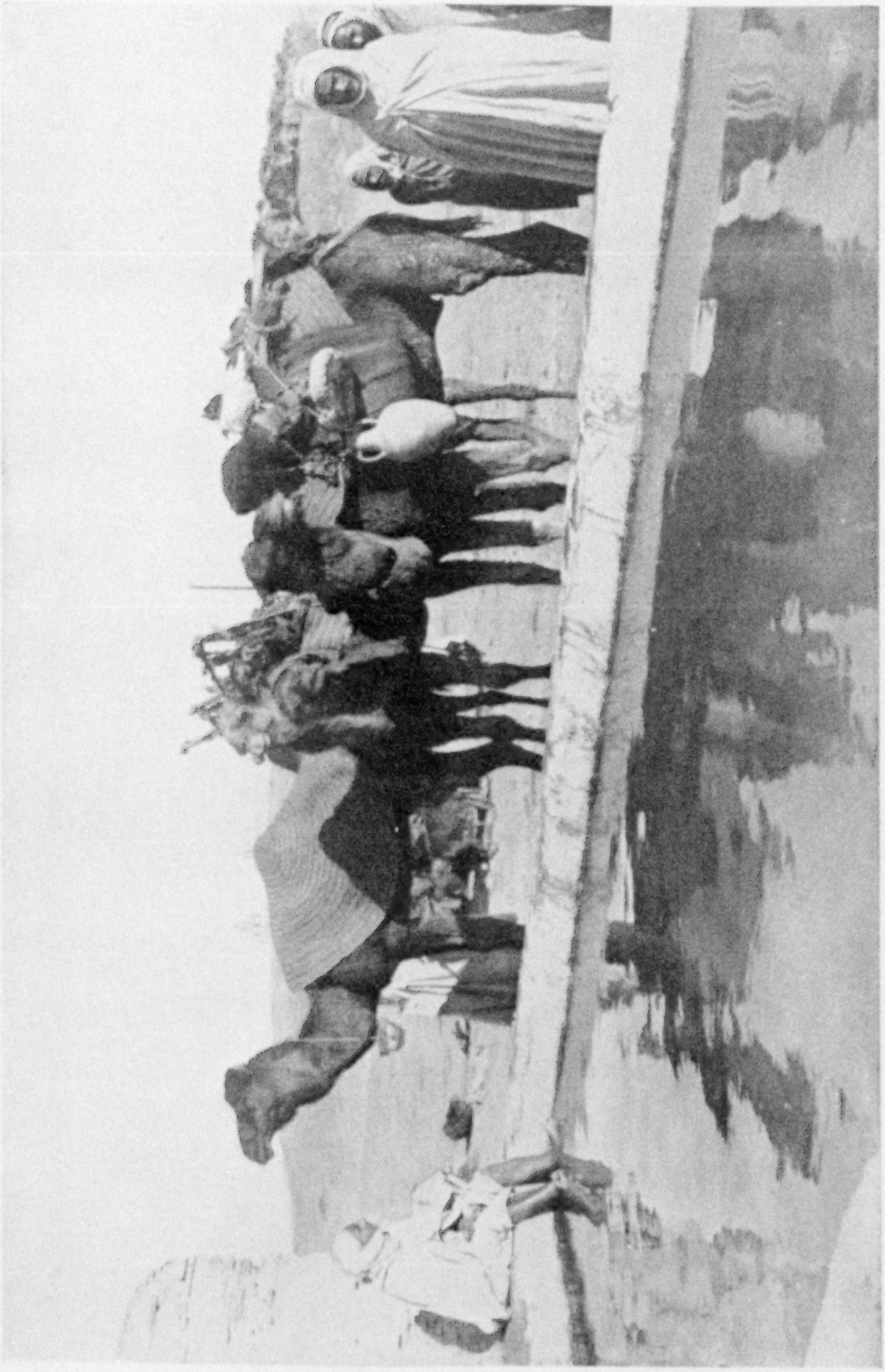
CUTTING UP CAMEL MEAT

would think the sheik the father of at least 12 infants, for children from two to 10 years old are curiously watching us. They are very fond of bonbons and sous. Whatever money one gives to the sheik is divided among the children. A beautiful bright-eyed girl of six is the daughter of the sheik, and she likes to

Photo by Lehnert & Landrock

CARDS, THE UNIVERSAL PASTIME

Notice the difference between the southern burnous and that of Tunis. The former shows traces of a Roman toga



CAMELS ABOUT TO FILL THEIR RESERVOIRS; NOTE THE HEN ON THE CAMEL'S BACK

Photo by Lehnert & Landrock

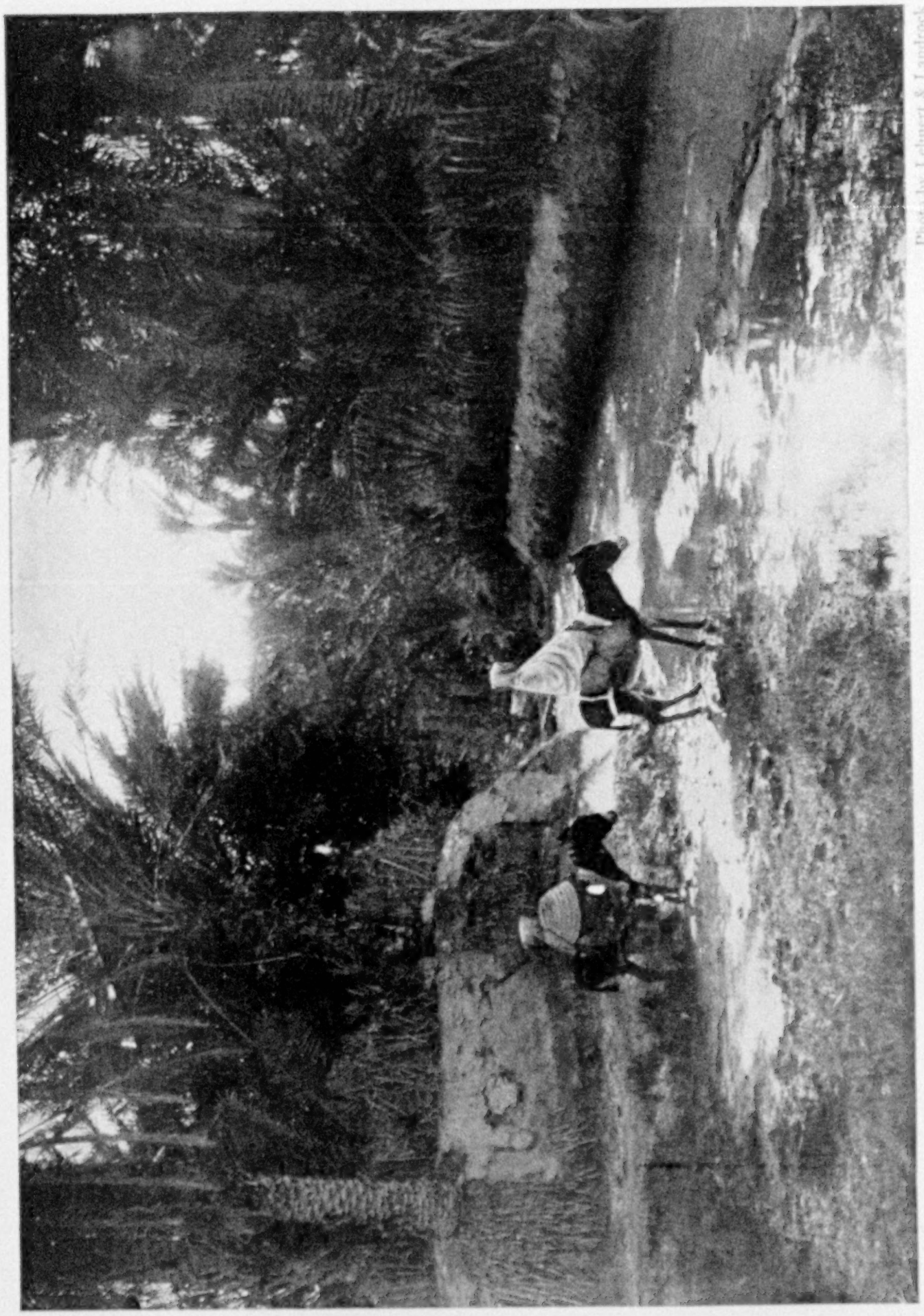


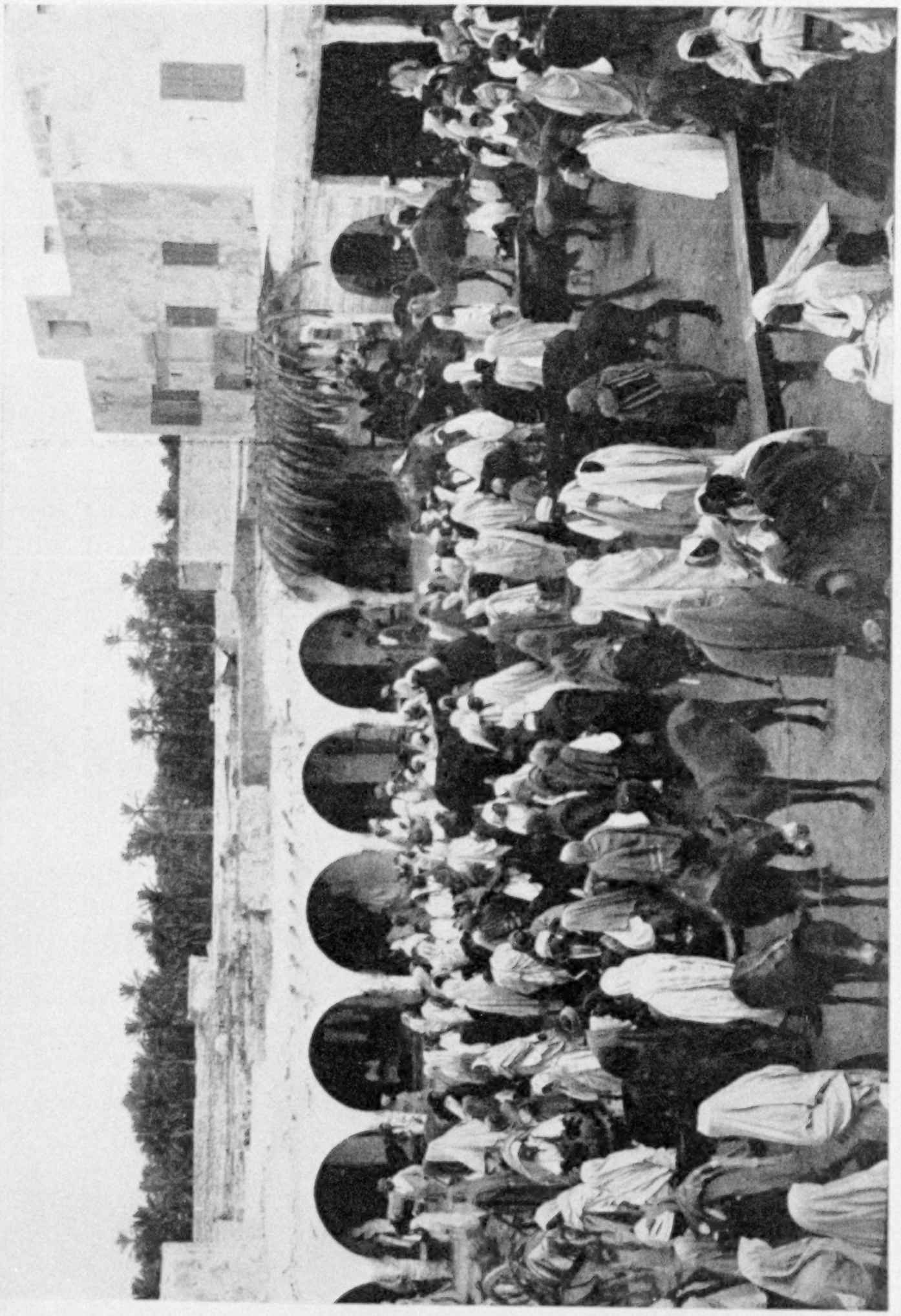
Photo by Lehnert & Landrock

THE APPROACHES TO GABES HAVE A BIBLICAL ATMOSPHERE

Were it not for this water an oasis could exist at Gabes. A very little water makes a Tropical oasis, a veritable Garden of Eden

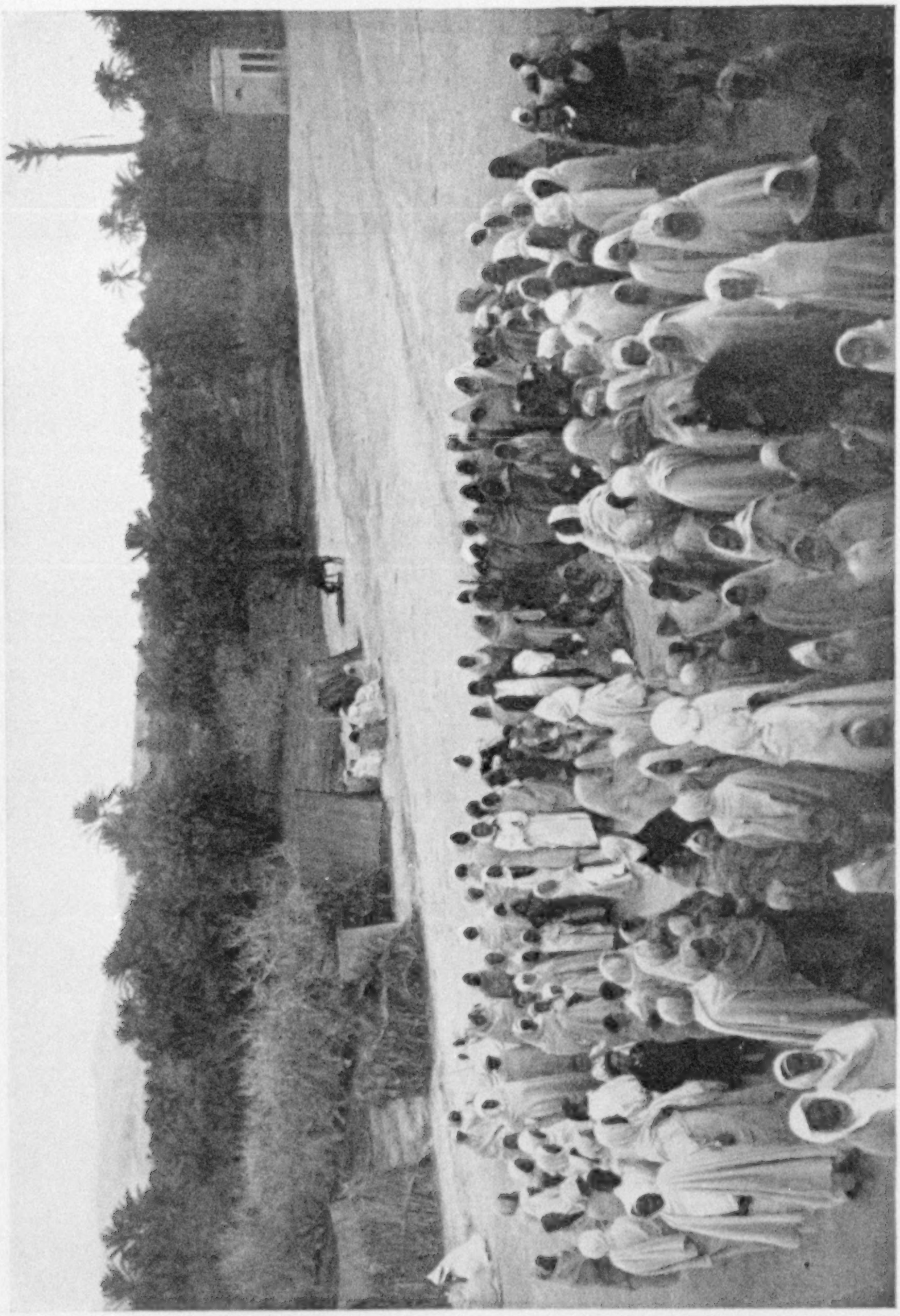
Photo by Lehnert & Landrock

A SCIENTIFIC GAME OF DOMINOES: GABES



DAILY MARKET AT NATIVE VILLAGE OF GABES

Photo by Lehnert & Landrock



AFTER MARKET: TELLING A STORY FROM "THE ARABIAN NIGHTS"

Photo by Lehnert & Landrock

Photo by Lehnert & Landrock

A MAN FROM THE SAHARA, WHO HAS COME TO TRADE AT THE MARKET OF FOUM TATAHOUINE

Photo by Lehnert & Landrock

A NOMAD WOMAN AND HER CHILD

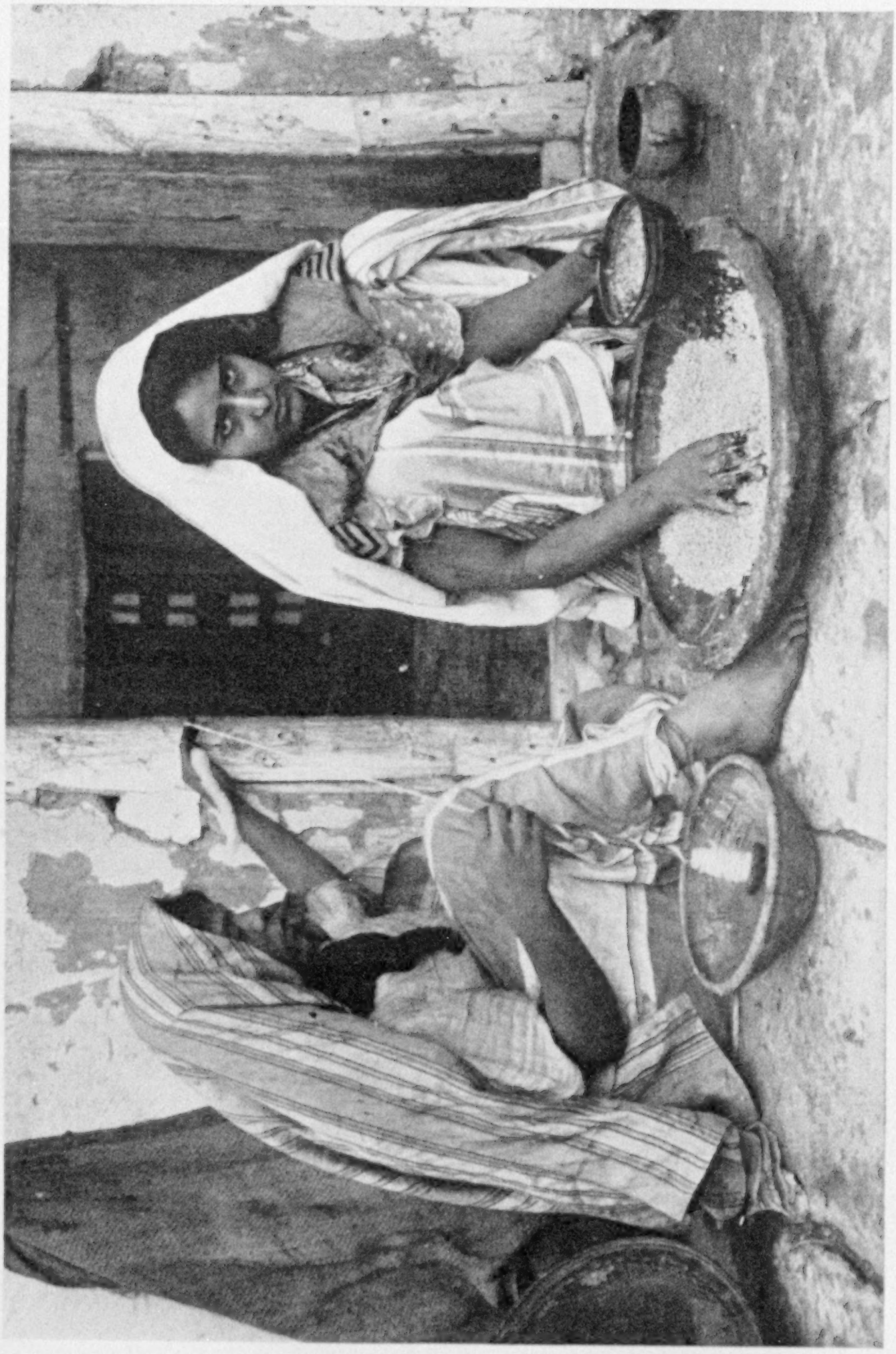


Photo by Lehnert & Landrock

NATIVE WOMEN PREPARING THE NATIONAL ARAB DISH OF COUS-COUS (SEE PAGE 843)

Photo by Lehnert & Landrock

STREET SCENE NEAR GABÈS

be photographed with her great chum, Aïescha, and her small brothers.

Pushing open a door made of palm-tree boards, we entered the sheik's cave. (It took one hour and a half to take the photograph printed on page 819.) The cave was white-washed. To the left is a wooden chest and a gun, one of many. Back of the gun is a stand cut out of the rock, and the dark object is an oil lamp—the form dating back to the Greek and Roman days. The white object in the center is a bedstead cut out of the rock, and there are comfortable mattresses filled with wool, and native blankets or rugs. Above the bedstead is a sort of cupboard, where one can put snuff, matches, or anything one likes.

To the right are large oil and water jars. At the back of the cave are couscous covers, the largest one having come from Ghadames. These covers and couscous plates are highly prized and very ornamental. Above the plates and covers is a Persian picture and an Arab almanac. When Mohammed had to flee from Mecca, 622 A. D., that date became the first year of the Mohammedan calendar, and is called "Hegiré."

THE WOMAN'S STATUS IN THE HOUSEHOLD

The wives of the sheik live in a cave similar to this next to it, and so do the sons and their wives and children. The question of rent is not of great importance. When a youth is strong enough to carry a gun and take care of some sheep or goats, or manage a few camels, he takes to himself a young wife.

When a man marries he has to give to the parents of his future bride a gift. These gifts may vary according to the tribe and country. In the mountain ranges around Foum Tatahouine and the Troglodyte villages and towns he gives four goats and two kids, four

Photo by Lehnert & Landrock

A NOMAD GIRL, NEAR GABES

sheep and two lambs, 20 liters of olive oil, 60 liters of barley and 40 of wheat, and all over southern Tunisia the fiancé has to give his future father-in-law a new fez cap and slippers, usually of yellow leather, made in Tunis. In some districts a silk haik is given to the mother of the girl. A dot of 30 piasters, equal to 18 francs ($3.00), is given; half the day of the marriage, the balance sometimes a year afterward.

These gifts are for a physically perfect girl. A poor man, not having so much money to buy gifts, can secure a wife blind in one eye, but otherwise sound, for a gift of less value.

In certain tribes the form of abduction takes place. The marriage and the value of presents is arranged between the families by a mutual friend. The bridegroom and his chums (this is the land of friendships like David and Jonathan) make up a small but warlike party, fully armed, and about midnight they stealthily approach the village tent or cave of his beloved, who is waiting. He puts her up behind him on his full-blooded Arab stallion and away they speed. Wails, lamentations, and gun shots come from the home of the girl. She is taken at once to the home of the mutual friend, who has arranged the marriage, and handed over to the care of the women.

In the morning a warlike party of men, fully armed, ride up and demand the release of the abducted girl. After a talk a feast is prepared and the gifts are taken to the home of the bride-to-be and the wedding takes place.

A knock on the door, and "Monsieur est il pret" were the words I heard one

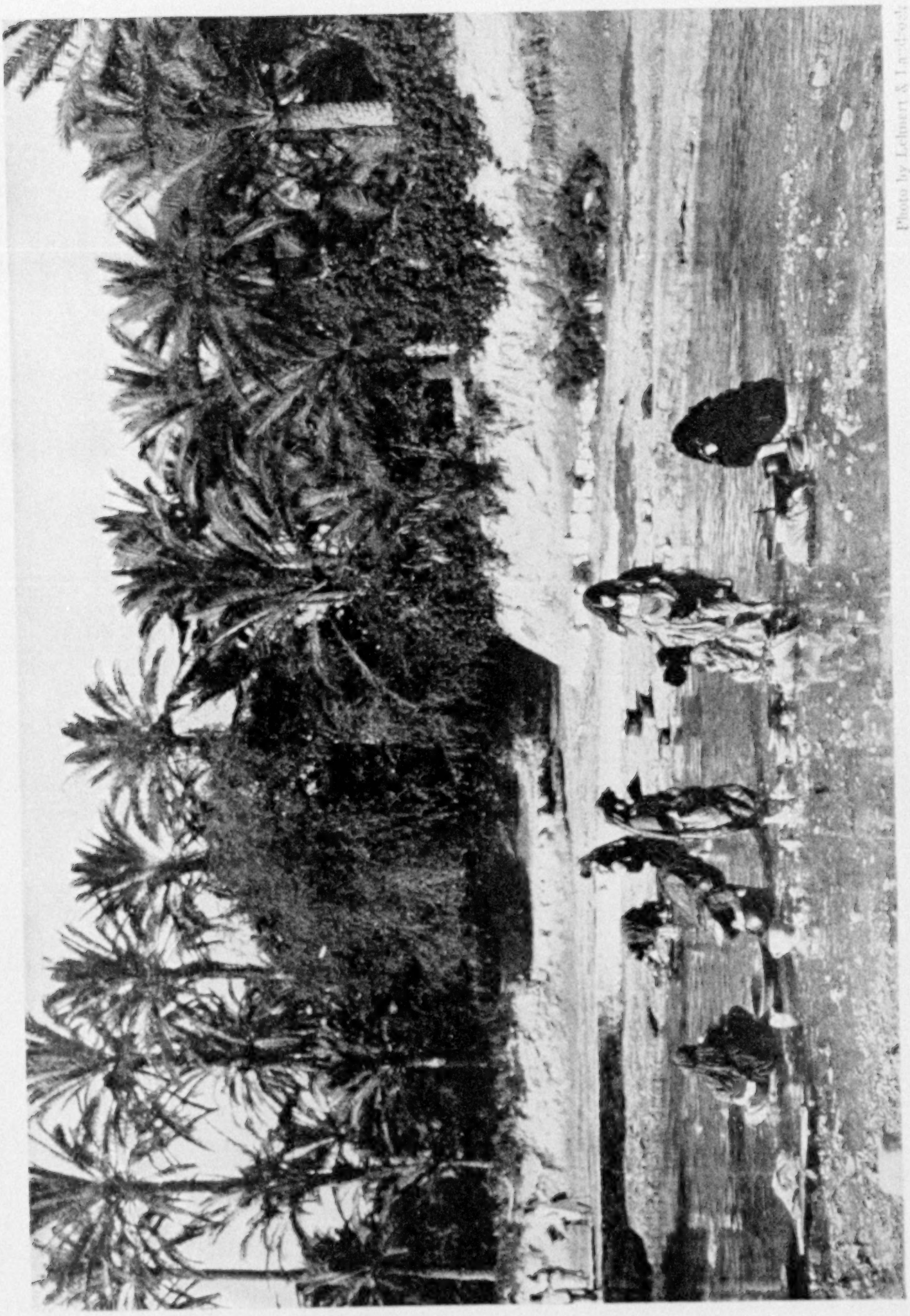


Photo by Lehnert & Landrock

NATIVE WOMEN WASHING IN STREAM NEAR GABES

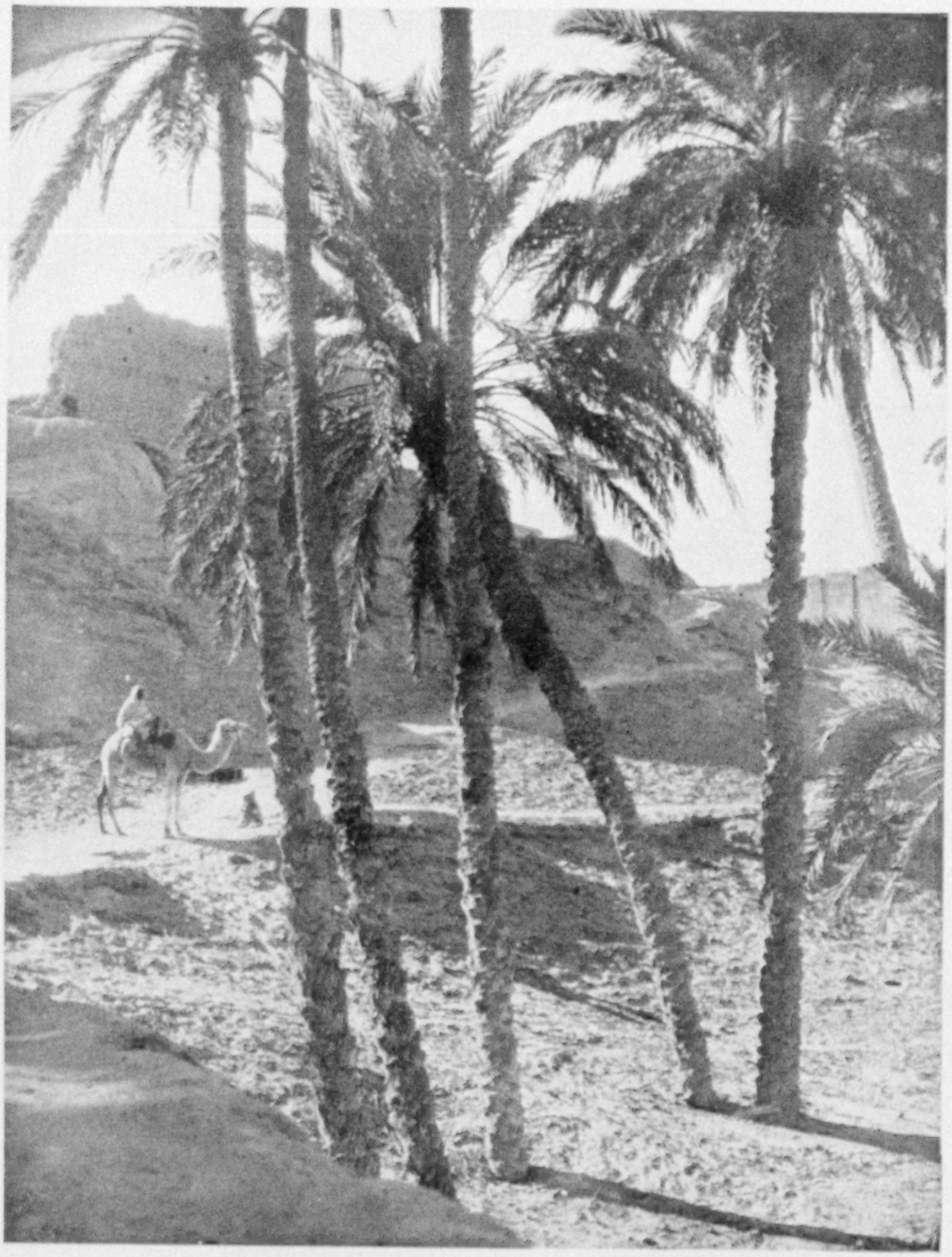


Photo by Lehnert & Landrock

PALM TREES OF THE SOUTH

Photo by Lehnert & Landrock

NATIVE ARAB TOWN NEAR GABES

ARAB CEMETERY OF ENTRENCHED SOUTHERN TUNISIA

Photo by Lehnert & Landrock

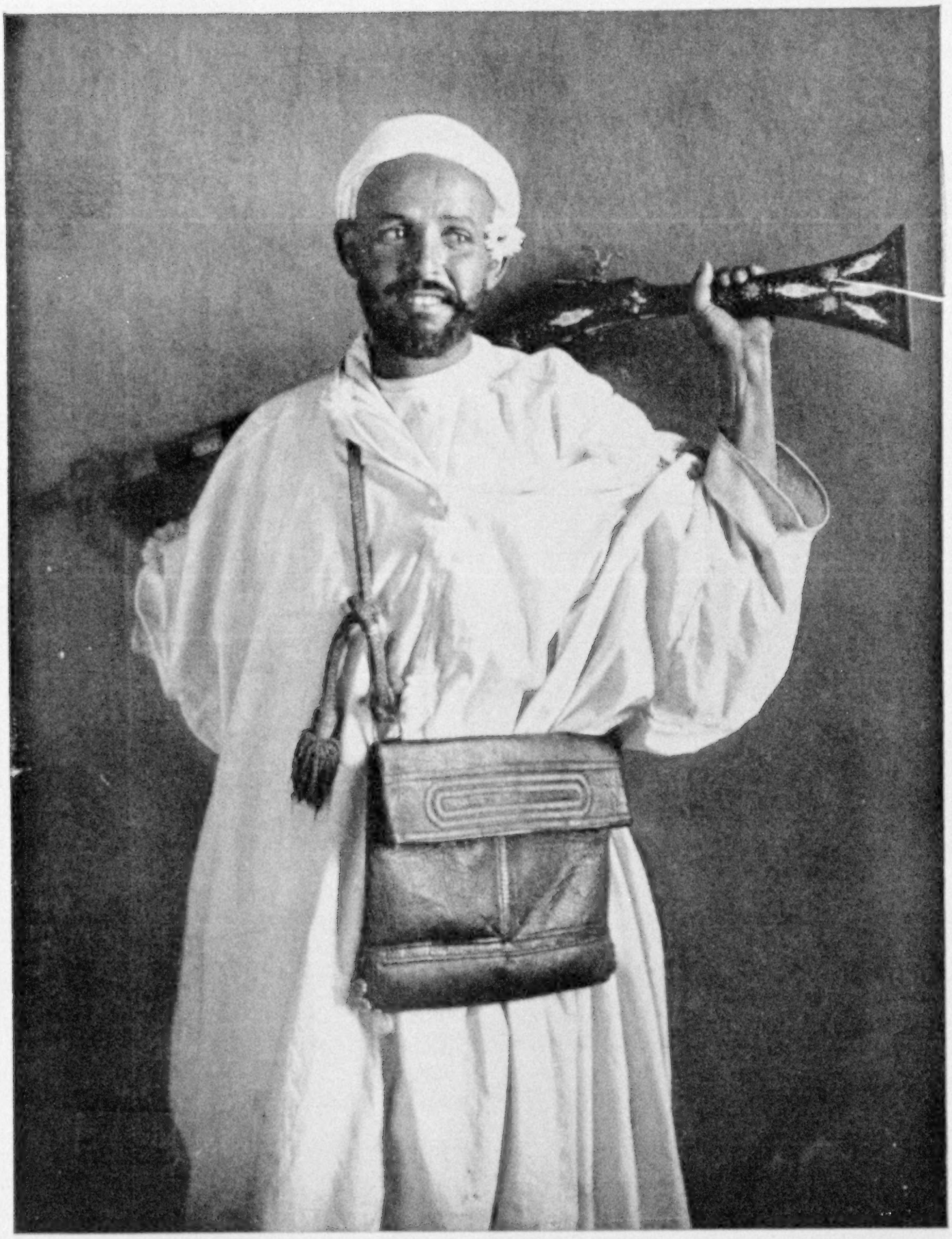


Photo by Lehnert & Landrock

A MAN OF EXTREME SOUTHERN TUNISIA; HE LOOKS LIKE BEN SAADA'S TWIN BROTHER

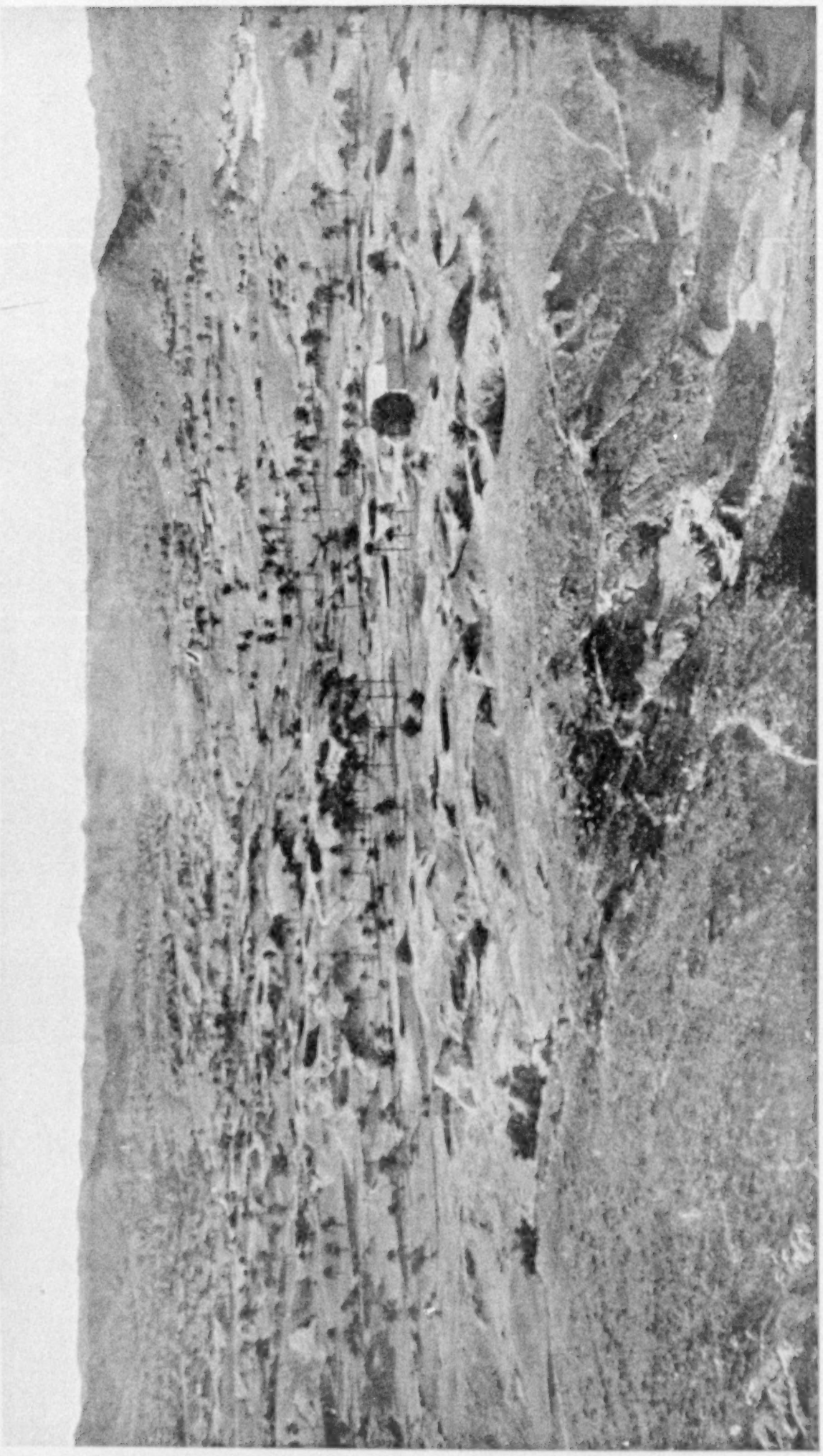


Photo by Huger

HOUAIA MOUNTAIN RANGES AND TOWN OF MATMATA, SHOWING THE HOLES IN THE EARTH IN WHICH THE PEOPLE LIVE

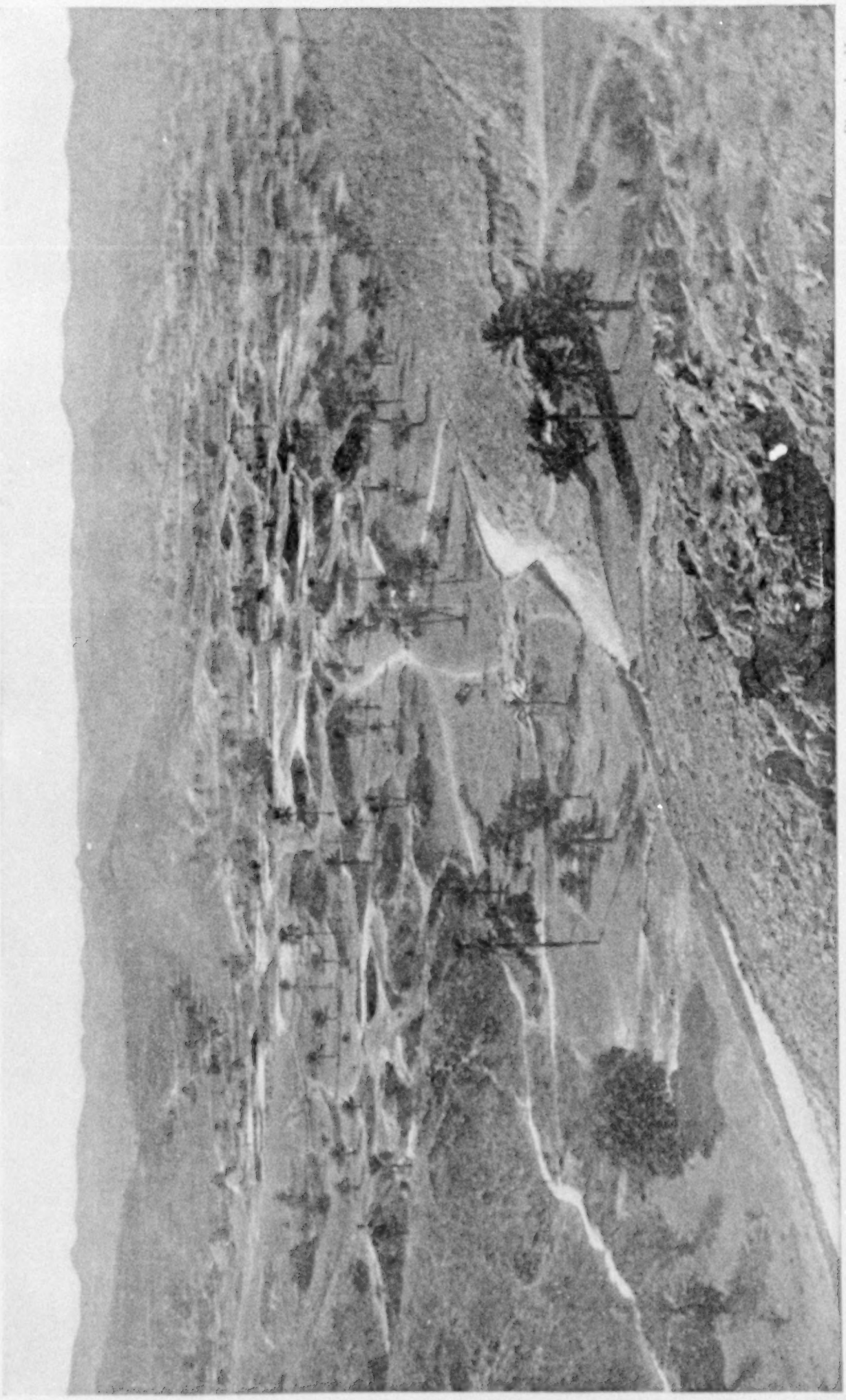


Photo by Huger

GENERAL VIEW OF MATMATA, A TOWN OF 5,000 INHABITANTS, WITHOUT ONE HOUSE

The holes in the ground, forming the entrances to their subterranean houses, may be seen (see page 793)

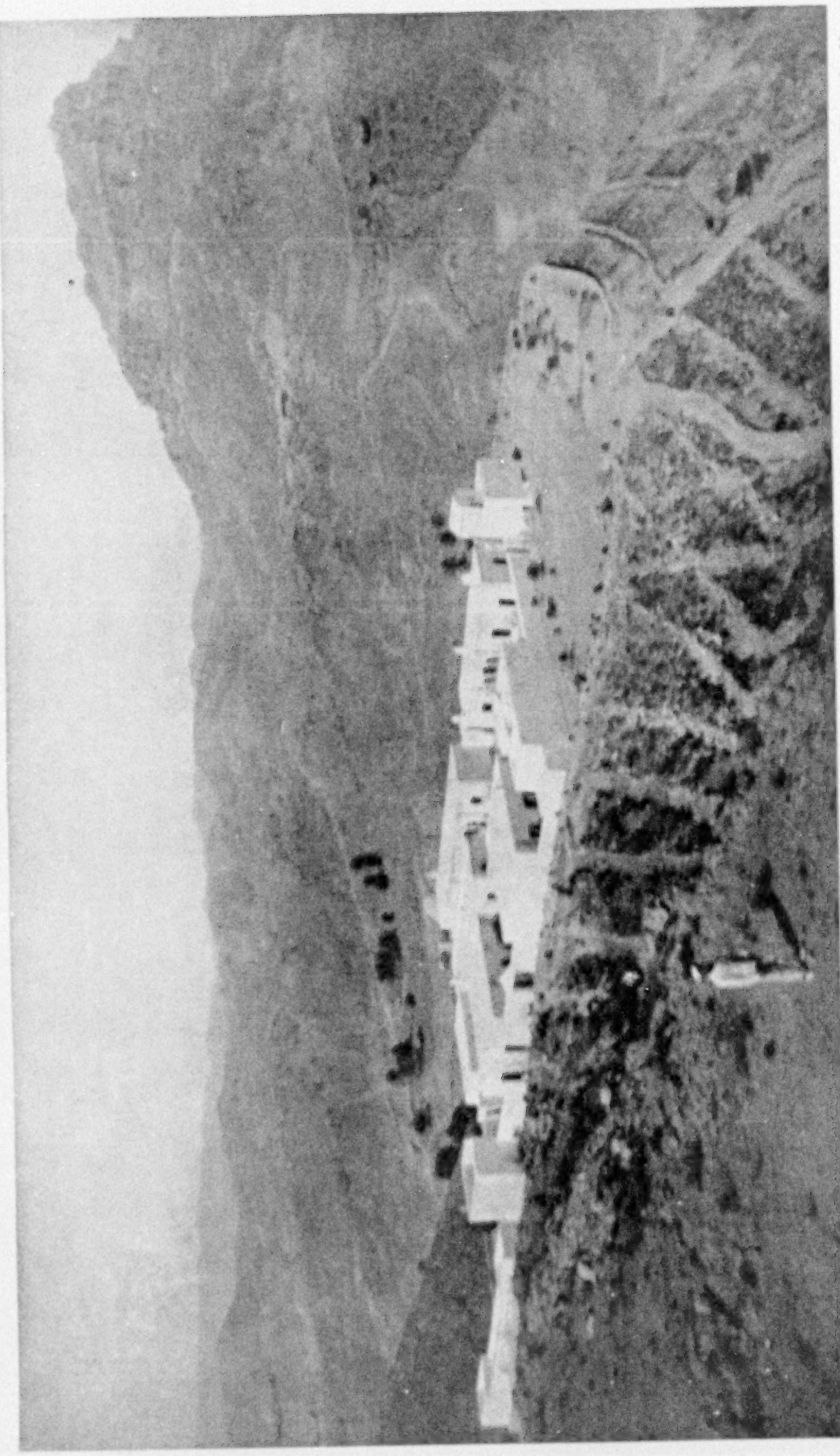


Photo by Huger

A MILITARY BORDJ AT MATMATA, SHOWING "KALAA," WHERE TROGLODYTES USED TO LIVE
The town of Matmata lies in the valley at the left

Photo by Frank Edward Johnson

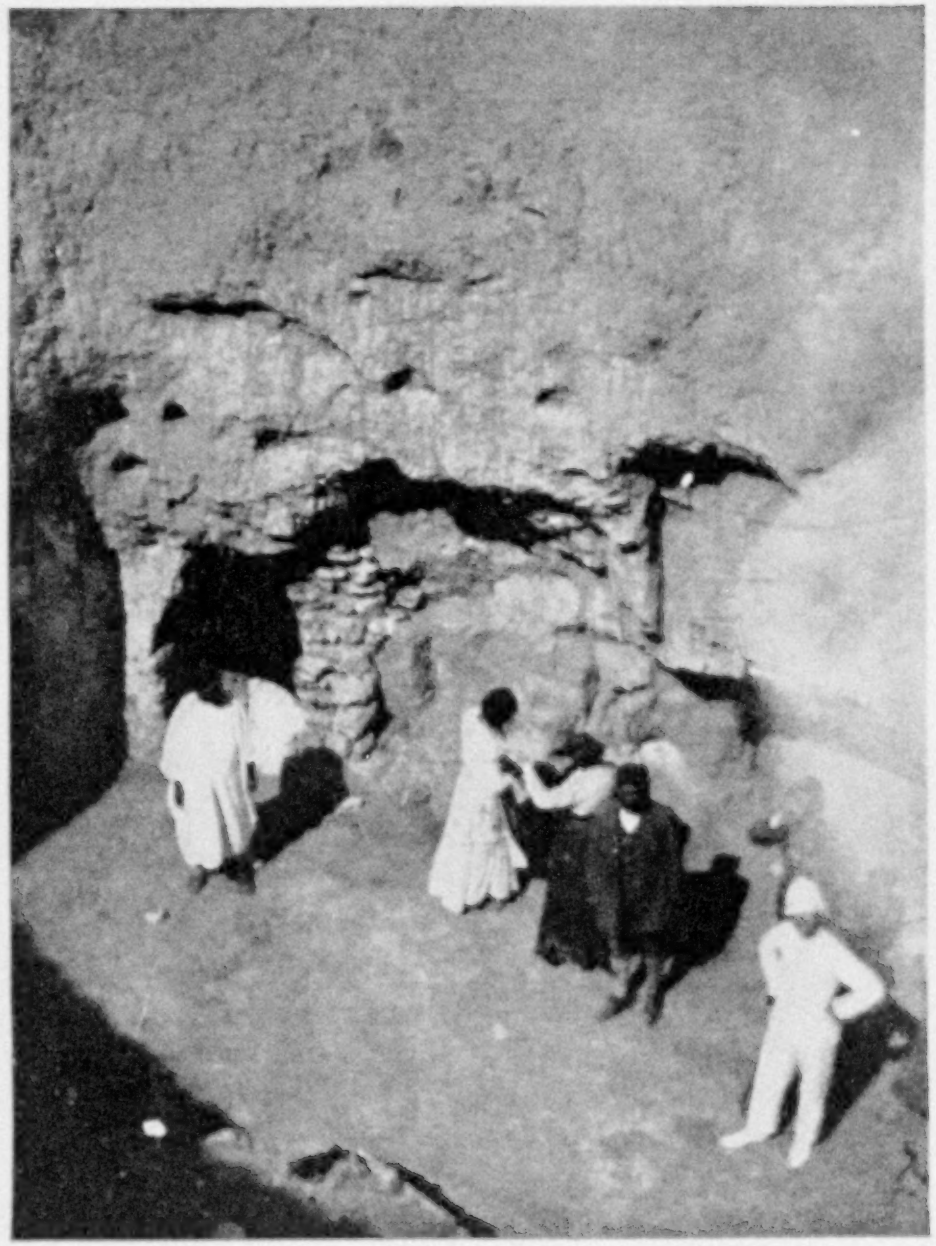
INTERIOR OF A JEWISH TROGLODYTE SCHOOL IN A TROGLODYTE CAVE: MATMATA

morning at 3:30 as I was boiling some coffee in my spirit-lamp before starting for Médenine. About 10:30 the evening before word had been brought that there was a place for me in the motor of the military commandant and intendant of Gabes, who were going for an inspection of Médenine. I gladly accepted this offer, as the 78 kilometers took eight hours in a stage-coach, and I wanted to push on to Foum Tatahouine. At such an early hour not a soul was awake, and I had to make the coffee myself or go without until we arrived at Médenine. Day was breaking as my kit-bag was fastened on the footboard of the motor, the air was fresh and bracing, and I was thankful that I had brought my heavy overcoat and steamer rug.

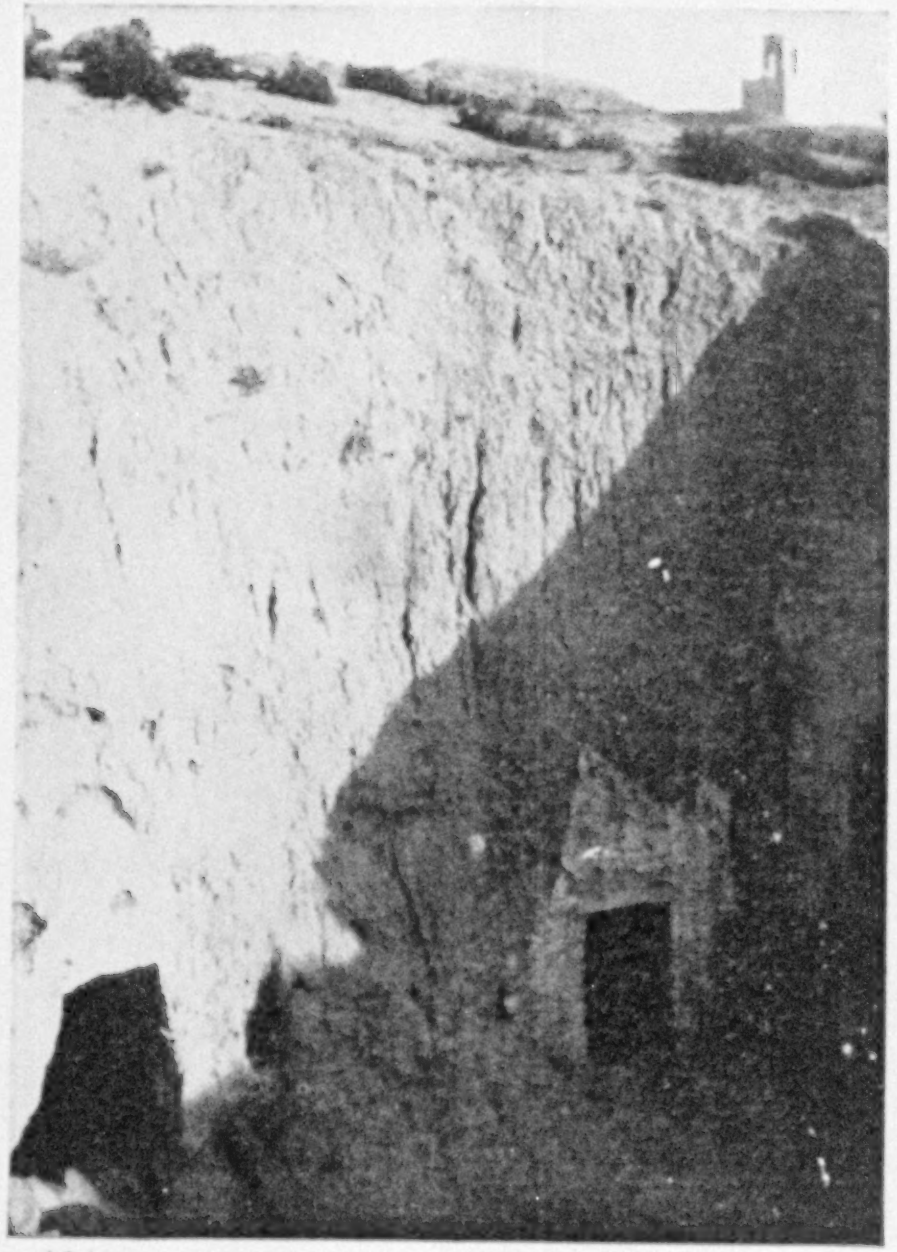
The sun arose in a mass of color and bathed the oasis and surrounding country in a glow of golden pink. We glided out of Gabes and kept up a speed of 30 miles an hour over the excellent road, just finished for the presidential visit of Monsieur Fallières. Last year this road was a so-called "piste," or trail.

The French have done and are doing marvels in northern Africa. One of the first things they do is to make good roads and find water, either by digging wells or by piping from springs in the mountains. Some of the roads in Tunisia were made by the Romans and they were easily converted into excellent macadamized roads, but most of them have been made since the French occupation in 1881. No country offers to the automobilist better roads, more picturesque landscapes, and comfortable little hotels than Tunisia and Algeria. The combined road mileage is over 3,000 miles. The secret of these roads being so good is the remarkable way in which they are kept up.

Large gangs of Sudanese workmen, with French overseers (foremen), water-



TROGLODYTE PATIO, TAKEN FROM THE TOP OF THE GROUND, LOOKING DOWN; A DROP OF 11 METERS FROM TOP TO BOTTOM



LOOKING ACROSS A MATMATA TROGLODYTE PATIO, OR COURTYARD: A GLIMPSE OF THE MINARET

Photos by Frank Edward Johnson

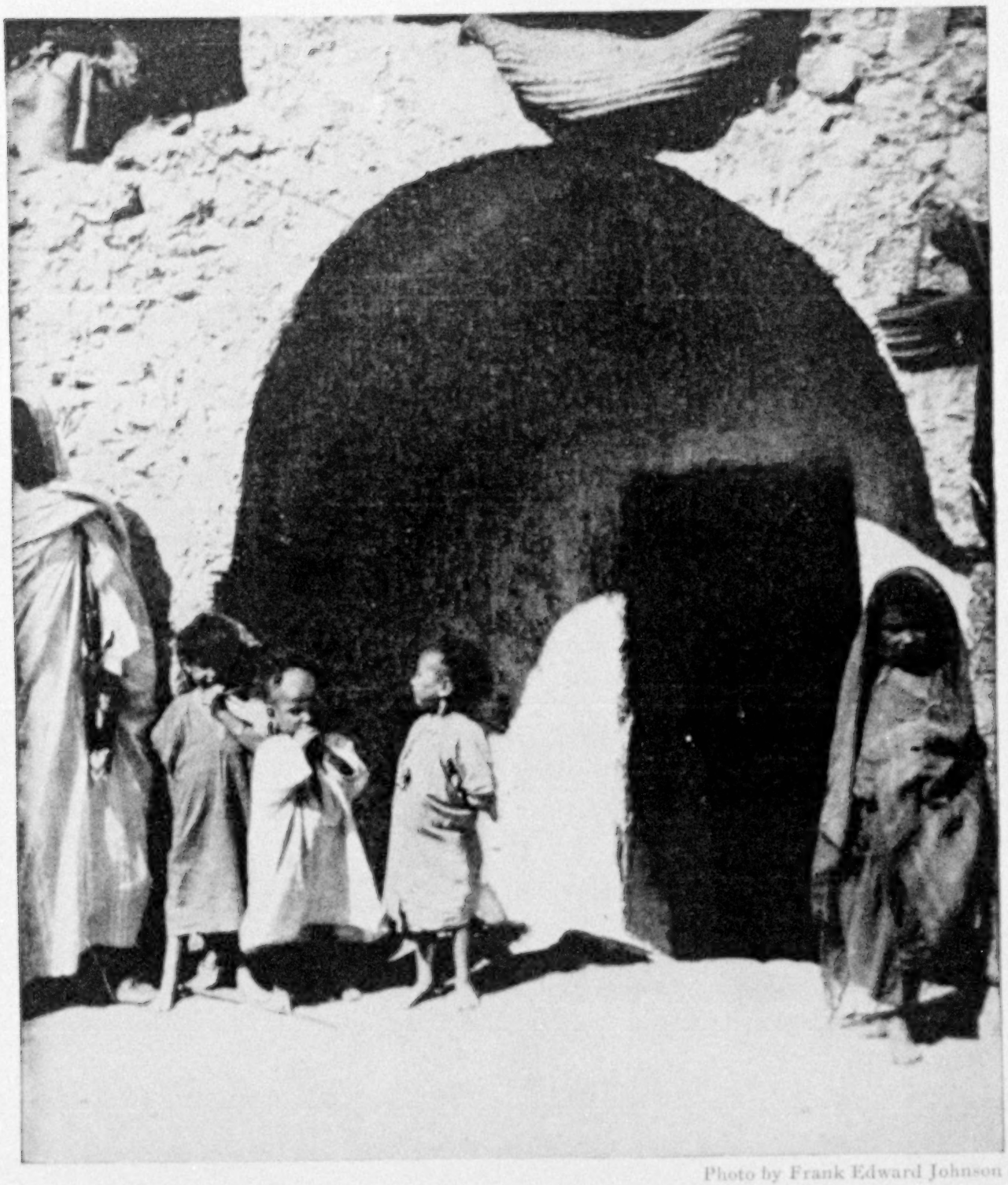


Photo by Frank Edward Johnson

ENTRANCE TO THE CAVE OF SHEIK FERDJANI OF MATMATA

ing carts, and steam rollers are to be seen at frequent intervals. A Sudanese stone-breaker receives one franc per cubic meter of finely broken stone. He sits naked save for a short cotton tunic and an old red fez, and with a small hammer pounds away all day long, singing or crooning to himself a Sudanese love song.

These men in "extreme southern Tunisia" live in "gourbis" on the roadside, and some have their wives and families with them. They are extremely fond of cigarettes, and as I rode past on horseback would frequently ask for one. A cart and mule, with negro or Arab driver, receives 4 francs 50 centimes a day of 10 hours for carting stone. A man that pulls the stones out of the ground receives 1 franc 25 centimes per day. In

Photo by Soler

TROGLODYTE COURTYARD, OR PATIO OF THE SHEIK OF MATMATA, SHOWING ENTRANCES INTO VARIOUS CAVES
(SEE TEXT, PAGE 793)

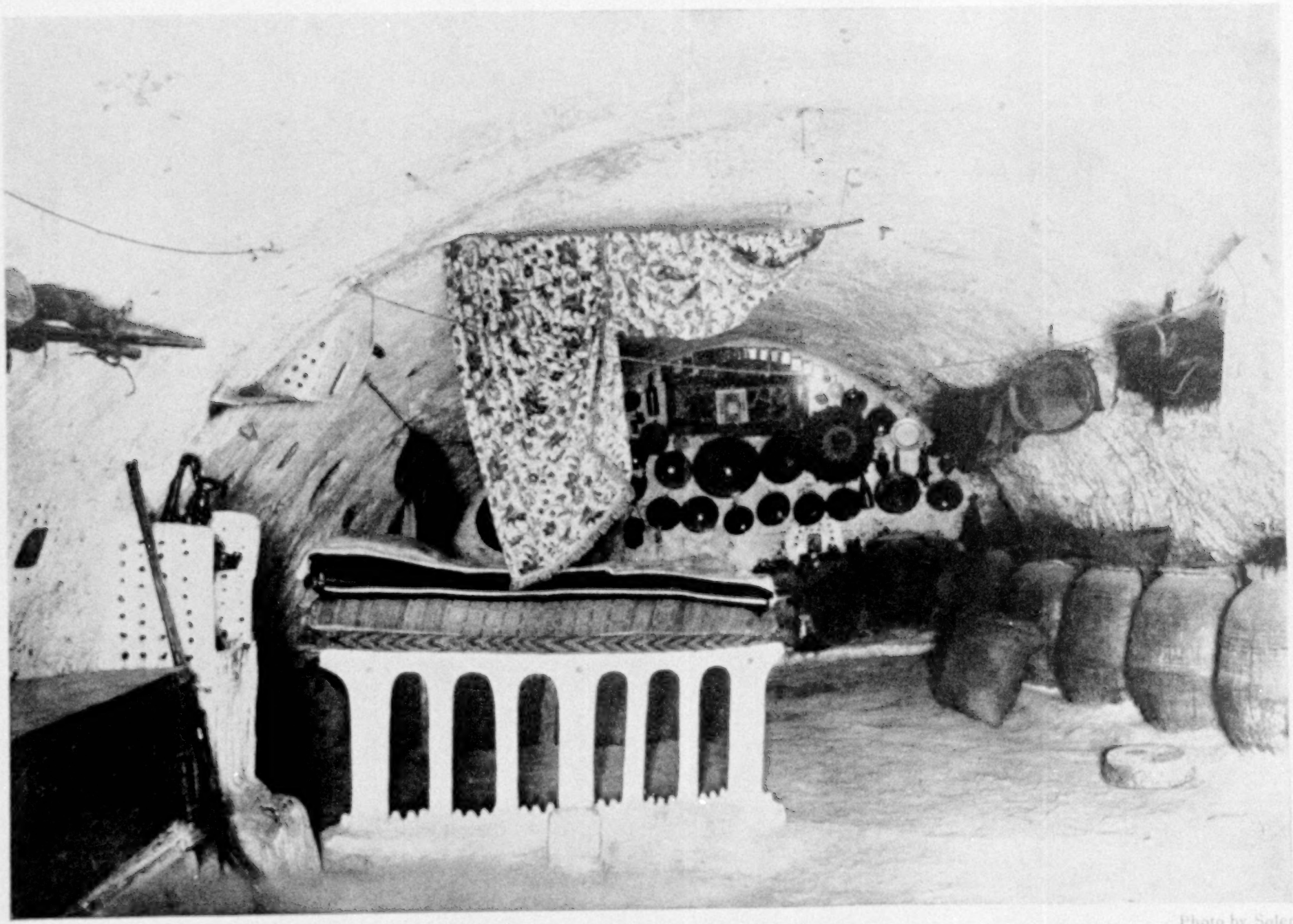


Photo by Soler

THE SHEIK'S PRIVATE CAVE: MATMATA

Photo by Frank Edward Johnson

A DAUGHTER OF THE SHEIK OF MATMATA ON THE RIGHT, AND HER CHUM AÏESCHA AND HER BROTHERS

the construction of roads the question of water adds a large item to price per kilometer, and water has to be had in order to roll the road properly.

A road once made requires, in order to be well kept up, for every 30 kilometers one foreman and four workmen, with mules and a watering cart. Then the road can be kept in perfect condition, and if kept up in this way will last from 12 to 15 years, whereas if neglected the road will be worn out in from four to five years.

To build a road in Tunisia costs from 5,000 to 7,500 francs per kilometer. The latter price is considered very expensive. These figures were given me by four contractors, now constructing portions of the road between Médenine and Foum Tatahouine, and verified by the chief officers superintending the construction. All southern Tunisia is under martial law, so that road-building comes under military supervision.

The country between Gabes and Médenine is arid save for small oases of palm trees that dot the landscape. A chain of bluish pink mountains stretches from northwest to southeast, and occasionally we catch a glimpse of dark blue sea off to the left (almost due east). We rush past shepherds watching their large flocks of long black-haired goats or broad-tailed sheep. Caravans of nomads are coming northward for the summer, and we pass their camps of numerous gourbis, tents made of goat and camel hair woven into a strong material; the countless Kabyle dogs bark furiously and the women and girls draw their haiks over their faces so that we may not see them.

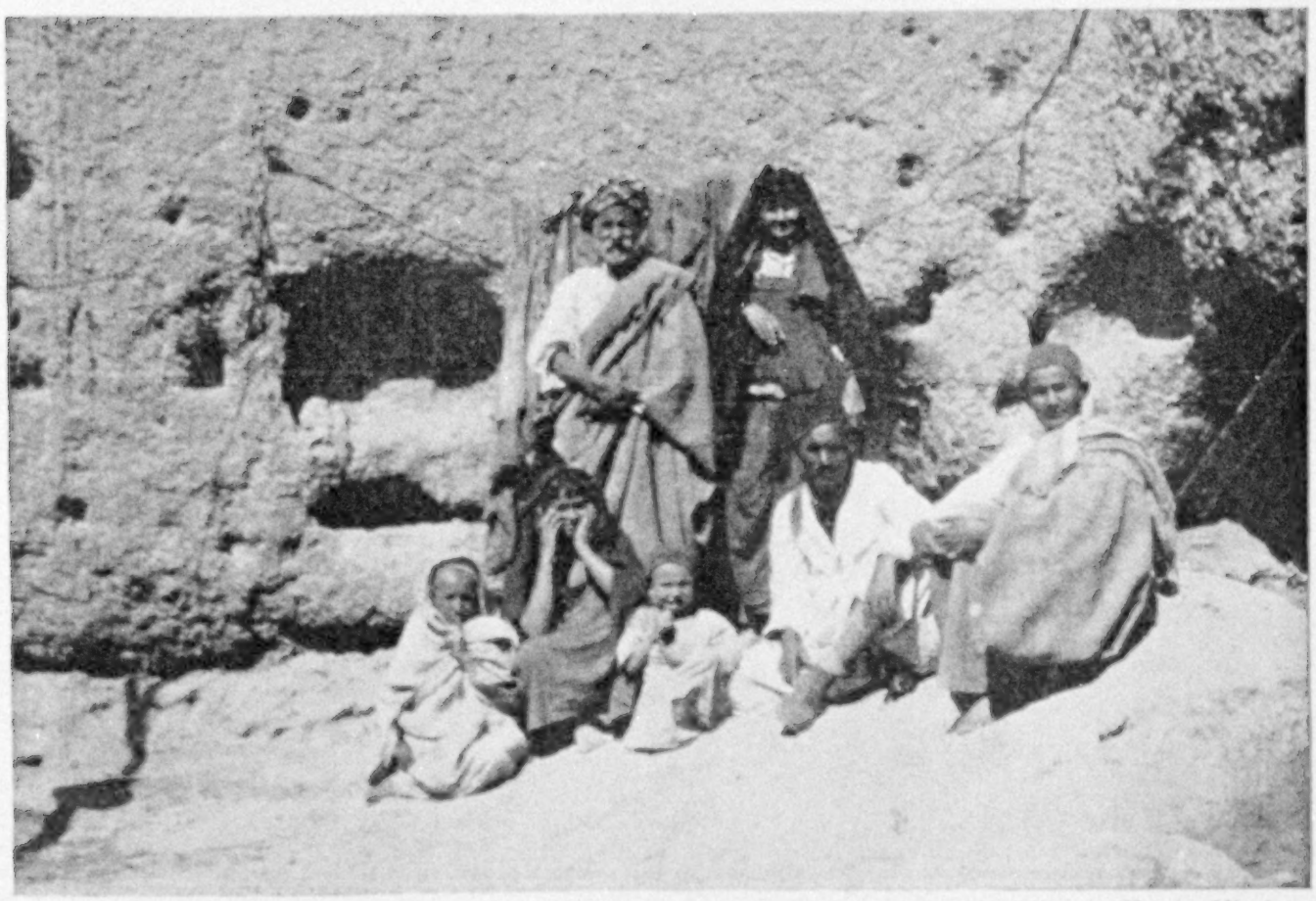


Photo by Katrice Nicolson

COURTYARD OF A HOUSE AT MATMATA, SHOWING THE OPENINGS LEADING TO LITTLE CAVES FOR THE ANIMALS

A Bedouin caravan on the march is very picturesque, but annoying when in a motor. The camels take fright, and one must slow down and even stop, for a large camel can effectively block any motor, and it is almost as bad in a cart, carriage, stage-coach, or even on horseback.

When on the march, the women, small children, and babies are placed on the camels, together with their gourbis, tent poles, water jars, and household effects. Older children are astride of donkeys laden with great panniers containing barley and large jars of olive oil. The men are very dark and thin, and each one carries slung over his shoulder a long-barreled flint-lock rifle, with which he is a dangerous shot. Powder costs money, and these nomads are extremely poor. Médenine is the military headquarters of this part of "extreme southern Tunisia."

Telegraph and telephone connect all the garrison towns, and there are regular mail routes by stage-coach, horseback, and by camel. The barracks, government buildings, post-office, and *cercle militaire* form a camp to themselves, and comfortable little villas are being built near by, with broad streets and large squares, with eucalyptus and pepper trees. Last year Médenine seemed almost the ends of the earth, so strange and foreign. On my return from the mountains and my journey to see various Troglodyte towns, Médenine, with its comfortable little hotel, its French cuisine, and clean rooms, with snow-white linen sheets, seemed to me to be civilization.

The Arab town of Médenine lies about half a kilometer away.

Sallust, writing on northern Africa during the period Rome dominated, remarks that he came into a strange country, where "the people dwell in curious abodes that resemble overturned boats cut in two" (see pictures, pages 825-826). This description is equally true after 2,000 years. Centuries come and go;

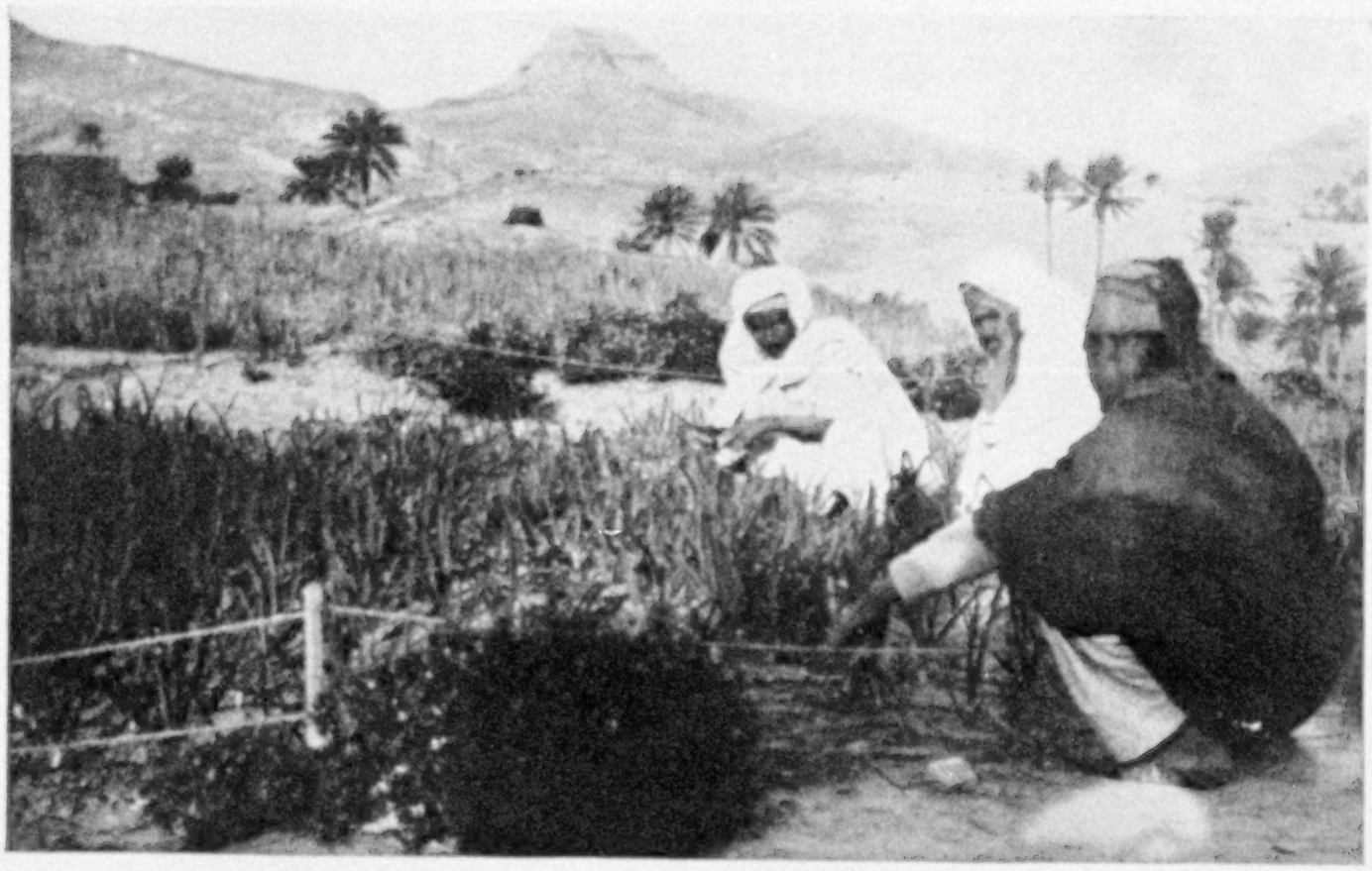


Photo by Frank Edward Johnson

THE ONLY VEGETABLE GARDEN IN MATMATA, IN FRONT OF THE MOSQUE

The mountain in the background is "La Kalaa," or "fortified citadel," where the people of Matmata used to live when they were "climbing" Troglodytes

great empires like Egypt, Greece, and Rome rise, fall, and vanish; yet back in the mountain ranges of northern Africa are various tribes of "Troglodytes," or cave-dwellers, living today about the same as did their ancestors during the life of Christ, and, if Roman and Greek writers are to be believed, these Troglodytes were then considered a curious and ancient people.

The numerous invasions of northern Africa, especially the Mohammedan and Berber invasions, must have left their impressions, but the chief interest to us is that the invaders were assimilated by the Troglodytes, and that their manner of life and mode of dwelling remained the same until the French occupation of Tunisia. The town, or "ksar," of Médenine consists of thousands of cave-shaped dwellings, made of native cement and stone, superposed upon each other to a height of four or five stories. The Arab name for these curious-shaped dwellings and storehouses is "rhorfa."

One ascends to these granaries or storehouses by means of projecting stones here and there (see page 826), worn smooth by centuries of use. The natives go up and down with great ease, but it would be impossible for one not accustomed to do so. Médenine acts as a high storehouse for about 20,000 people, semi-nomads, living in the great plains, people of the tribes of Ourghamma.

The town has been built in great ovals or horseshoes, each tribe or district to itself to prevent stealing (see photos, pages 804, 805, 825). Armed men guard these precincts.

Metameur is another town built like Médenine. It has a remarkable ksar or storehouse and fortress for use in times of war. The women of Metameur have always been celebrated for their beauty, and it has withstood many sieges.

One good harvest every four years is the average around Médenine, so that the country only raises half enough grain to

sustain the life of its inhabitants. The rest is bought at the markets of Gabes, Zarzis, and Djerba.

On my arrival at Médenine, I went immediately to see about hiring a cart and horse to take me to Foum Tatahouine. Officers at Gabes had given me the address of Monsieur Courtier, a contractor, who usually has a number of spare animals. On going there I found that four of his horses were laid up with sprains or bad cuts and the other two available animals in town were also hurt. Monsieur E. Michal, a French officer of the "Affaires Indigenes" and an old friend of mine, sent word to the Caid of Médenine that I wanted to push on to Foum Tatahouine to visit the cadi, and asked if the caid knew of any horse or mule that I could hire. An answer came back very quickly that "The caid had a very strong fast mule that he would lend me." So after lunch up came the mule and Monsieur Courtier's small two-wheeled cart and Ali, the driver. About 1 o'clock off we started. The landscape had been wild between Gabes and Médenine, but it grew wilder the nearer we approached the curious mountain ranges or table-lands, varying in height from 400 to 750 meters.

Between Médenine and Foum Tatahouine, a distance of 52 kilometers (32½ English miles), not a house or village is to be seen. The government has built a "bordj" at "Bir-El-Ahmeur," which means the "red well," about half way between the two towns.

One finds military bordj at intervals over the country; they are military "caravansaries," where officers, soldiers, and officials can find water and shelter. There are always ample water and one or two large rooms for officers, a room for soldiers taken ill or wounded on the march, a series of watering troughs, and a house or room for the Arab guardian and his family. A high wall of substantial masonry surrounds this military camp, usually built in the form of a square, with a large courtyard in the center. There are loopholes in the walls for shooting and strong gates, so that this miniature fortress could withstand a siege.

Only after riding long distances on horse or camel through arid plains or sandy deserts without shade can one appreciate the sight of a hideously ugly bordj, for somewhere around its four high walls can be found welcome shade, where you can throw yourself down and rest. You will not mind your horse or mule carefully picking its way over your prostrate body, so that it, too, can be in the shade.

Almost before the bordj came in sight horses and mules would prick up their ears and want to push eagerly forward, tired as they were, for the water of the "Red Well" is not brackish, and they can drink their fill. Through nine kilometers of deep sand, where the wheels sank in half way up to the hubs, Ali and I had to walk. We saw curious effects of mirage of mountains, lakes, and green oases, where we knew only sandy deserts existed. A small white maribout glistened away off to the left. It seemed as if we would never get there. Then came a turn and 28 kilometers of excellent macadamized road to Foum Tatahouine.

As we draw nearer, two specks stand out against the white road, which grow into horsemen riding at full speed—the cadi and caliph coming to meet me—the first mounted on a superb dark gray stallion and the other on a white, with its tail, mane, and hoofs stained red with henna. My welcome was a warm one and very sincere. A house had been prepared for my arrival and furnished with European furniture—tables, bureaus, sofas, chairs, looking-glasses, and a modern metal bedstead, mattresses, and native woolen blankets. The house was built of stone, with very thick walls, so as to be cool in summer. It belonged to the cadi and was situated on a hill overlooking the pretty little town of Foum Tatahouine, and was not two minutes' walk from the cadi's own house and his law court. The cadi's full name is Mohammed Es-Seghir-Cadi du Djebel-El-Abiodh, which means "Cadi of the White Mountain" (see picture, page 831).

The mountain back of Tatahouine con-

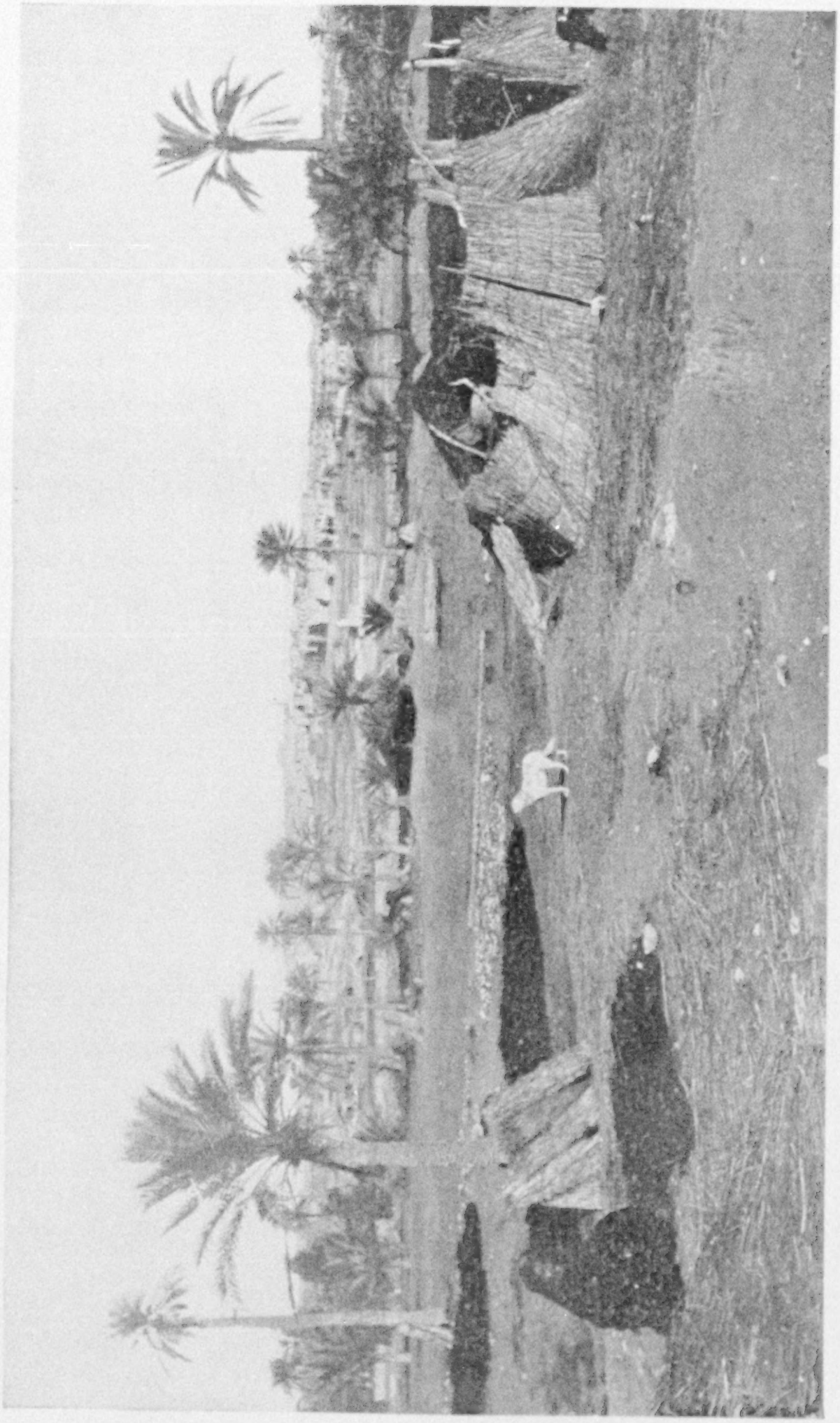


Photo by Soler

PANORAMA OF THE "KSAR" OF MÉDENINE, TAKEN FROM NEAR THE MILITARY CAMP AND LITTLE FRENCH TOWN NOW GROWING UP: NOMAD GOURBIS AND A YAPPING KABYLE DOG IN THE FOREGROUND

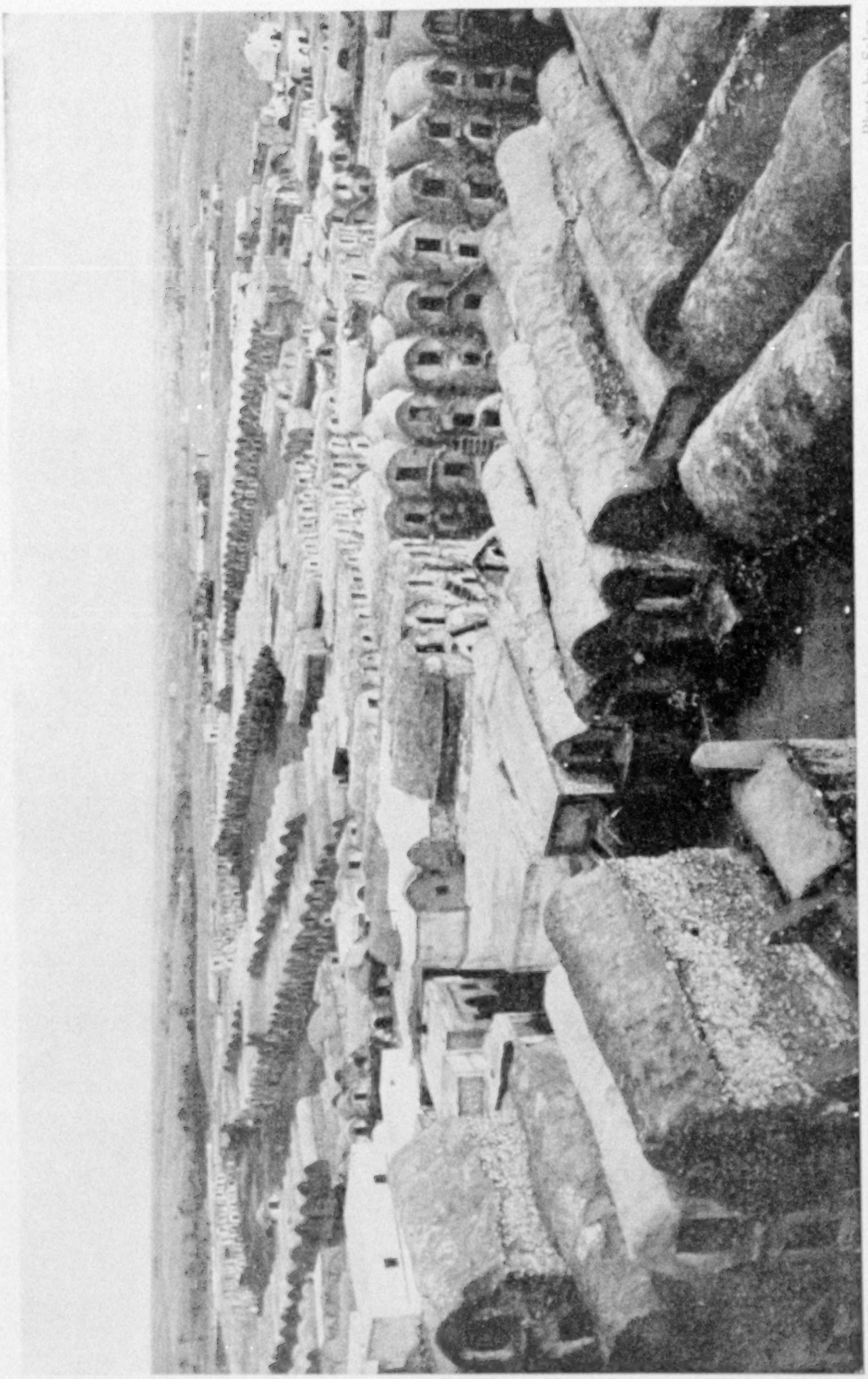


Photo by Soler

GENERAL VIEW OF MÉDENINE, SHOWING HOW RHORFAS WERE BUILT IN THE FORM OF AN OVAL, OR HORSESHOE, TO KEEP OUT THIEVES: EACH SMALL TRIBE TO ITSELF (SEE PAGE 822)

Photo by Soler

KSAR OF MÉDENINE

The "Rhorfas" superposed are used as granaries, storehouses, and dwellings by about 20,000 people. The tribe of "Ourghamma," Caidship of Médenine. (See text, page 822). The only means of access to the upper stories are projecting stones and occasional steps.

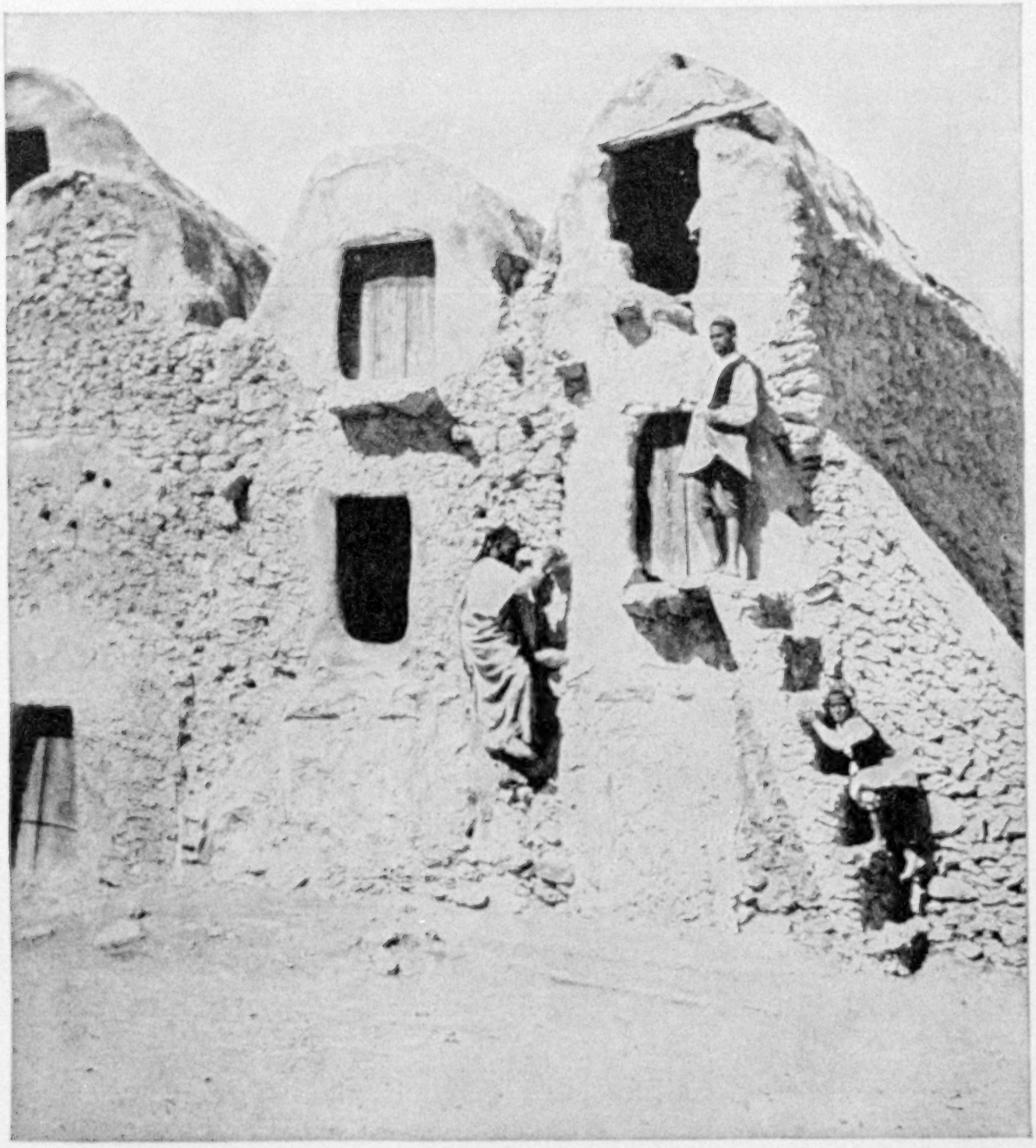


Photo by Katrice Nicolson

INHABITANTS OF MÉDENINE CLIMBING INTO THEIR HOMES

tains great quantities of magnesium and stands out white against a range of pinkish mountains; hence its name, Djebel-El-Abiodh (the White Mountain).

After the Bey of Tunis and his prime ministers comes the position of caid. He administers the government, acts as supreme judge, and collects taxes and debts. A caliph represents the caid in districts far away from where the caid resides, but he cannot collect taxes.

A cadi is the head of the religious code. The Koran being the law, the cadi sees that the law is carried out; but it does not mean that he is a priest. He acts as judge in family disputes, in matters of inheritance, in questions of land. He marries and divorces, and above all he acts as peacemaker. Many were the wise judgments I heard during my stay at Foum Tatahouine.

A retired chef from Chinini, who had

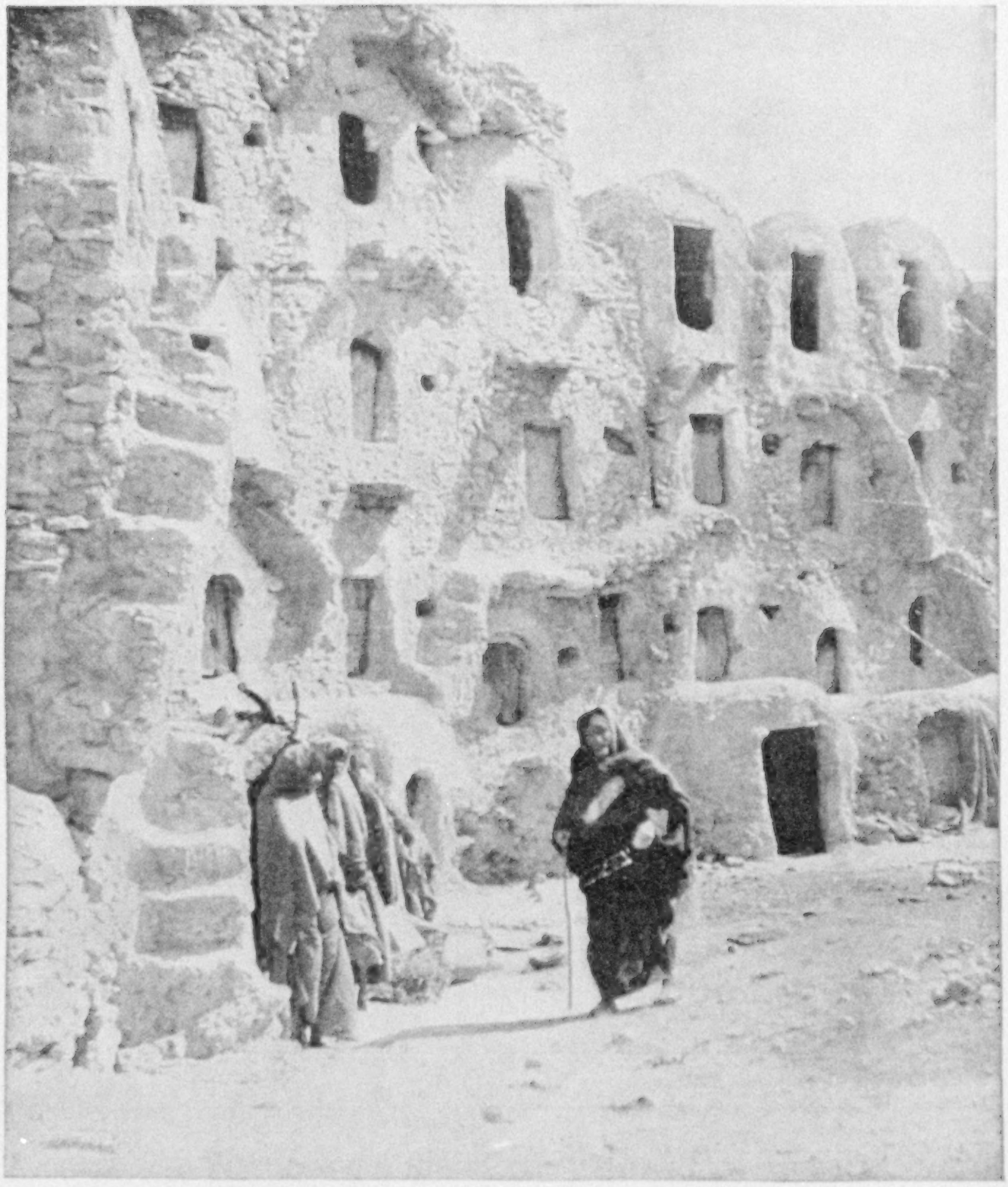
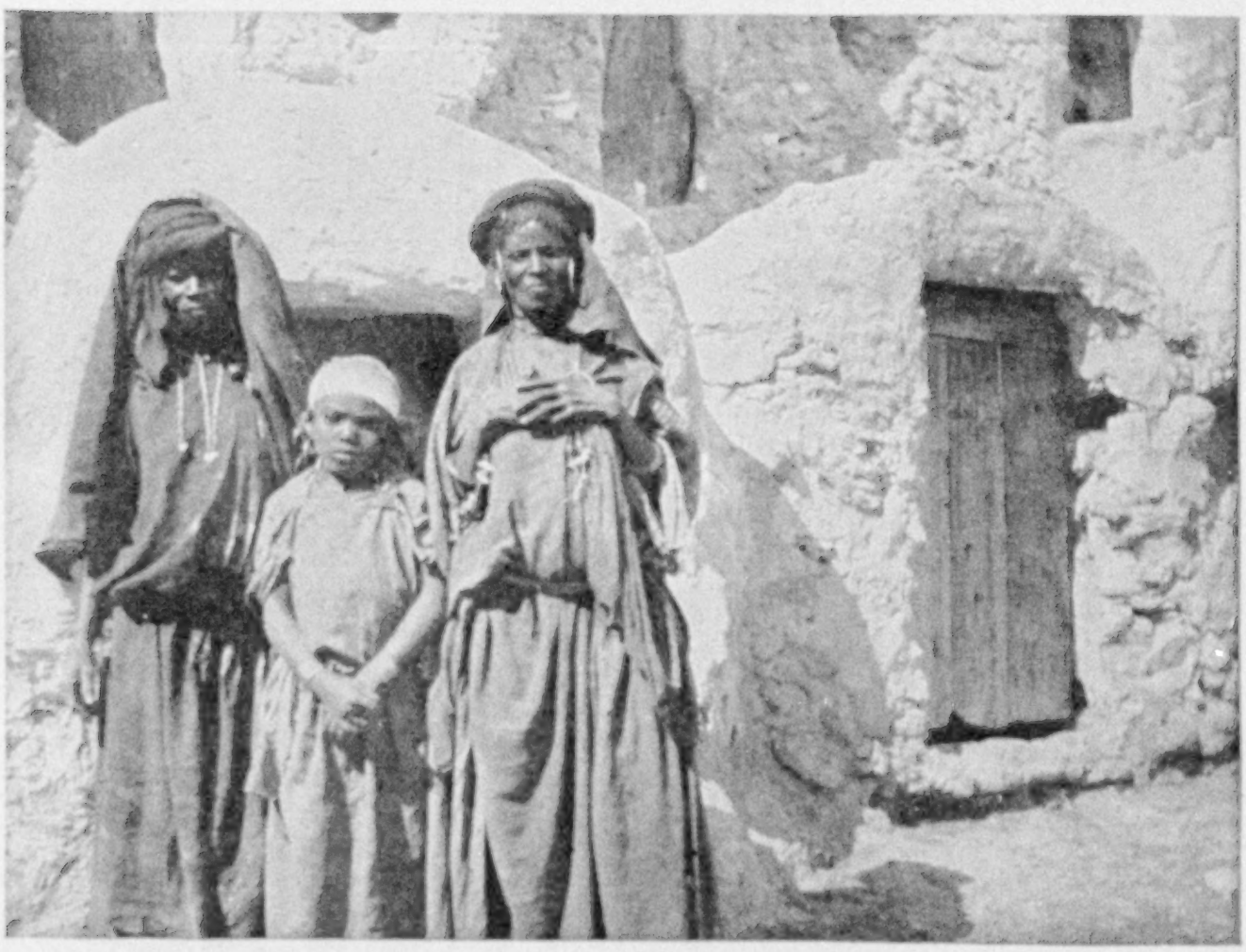


Photo by Katrice Nicolson

STREET SCENE IN MÉDENINE

been head cook for the officers' mess for over ten years and had earned enough money to retire and live in comfort and peace, had come down to attend to the commissariat department during my visit. Mohammed Ben Sada was his name, and he loved work and he loved to cook. The greater number of courses the more pleased was Sada; the more friends that dropped in to déjeuner or dinner the broader the smile on Sada's face.

The Troglodyte town of Chinini has a great reputation for first-class cooks. One man was called to Rome, and was chief pastry cook to Pope Leo XIII.



Photos by Marie Helms

WOMEN AT A WELL IN MÉDENINE

WOMEN OF MÉDENINE

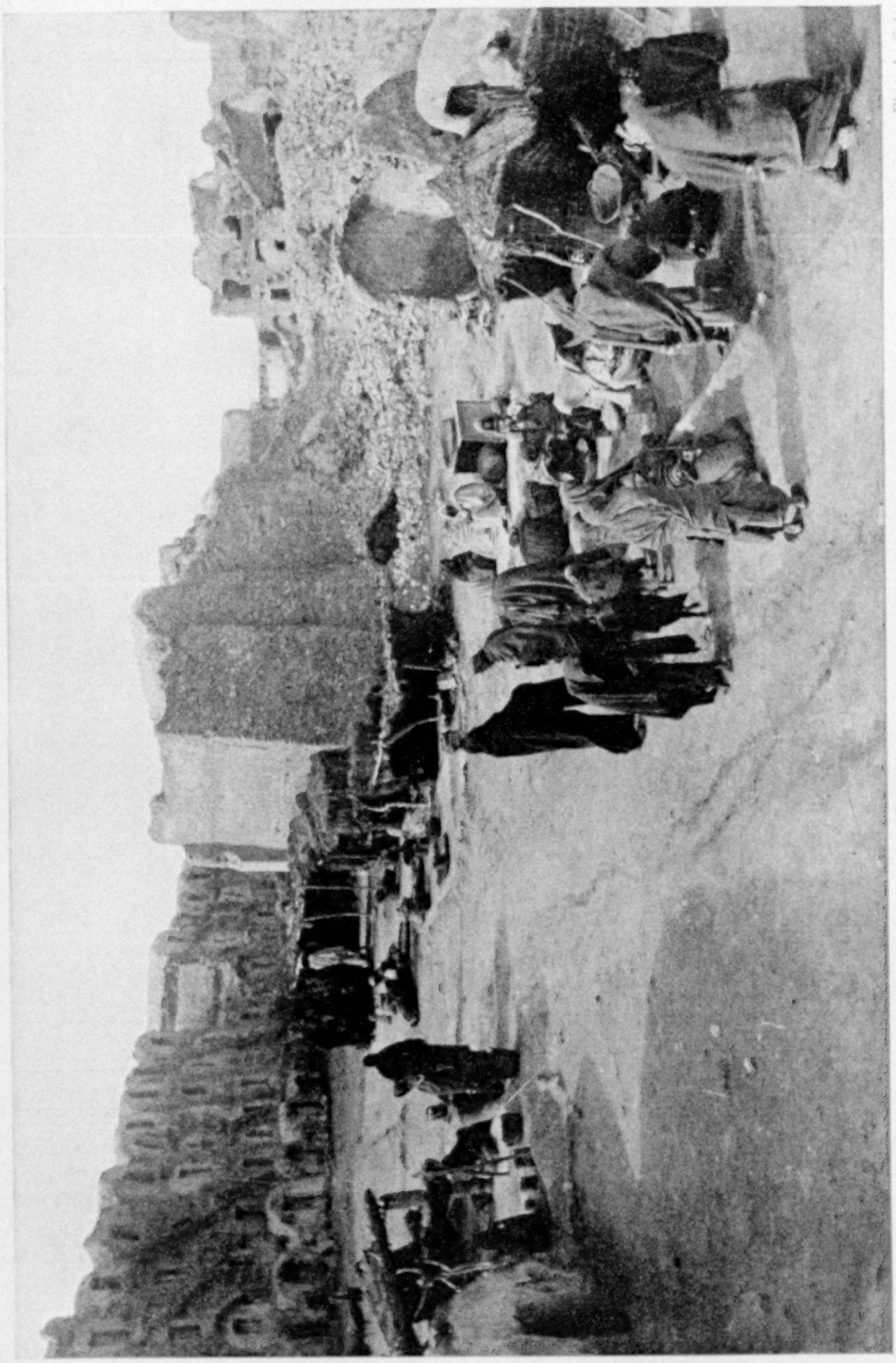


Photo by Soler

MARKET AT MÉDENINE: A NEW MARKET-PLACE HAS RECENTLY BEEN FINISHED, AND THE PASSING OF OLD MÉDENINE HAS COMMENCED

Photo by Frank Edward Johnson

MOHAMMED ES SEGHIR, CADI DU DJEBEL-EL-ABIODH, AND HIS LITTLE DAUGHTER, MABRUCKA

Another was employed as cook at the Residence Generale de France during the regency of Monsieur Massicault.

The cadi has adopted his nephew, Mohammed, a youth of about 18, and he has a sweet little daughter about eight years old and three small sons. Courtesy forces me to draw a veil over his family life. I was his guest and, knowing Oriental etiquette, never asked questions about the life within his closed doors.

Foum Tatahouine is situated 52 kilometers south of Médenine, at the base of a picturesque gorge and at the foot of Djebel-El-Abiodh (the White Mountain). It is surrounded by sharp peaks and high table-lands, in which are dug the dwellings and villages of the tribes of Ouderna.

Four large oueds, dry river beds (barrancas in Spanish), traverse the country of Tatahouine. They are dry except during the rainy season, when they are fed by a great number of little oueds, called by the Arabs "chebat." Their banks are fertile, and barley can be grown in the valleys watered by these streams. Enough can be raised to live on in average years, and in good years sufficient can be raised to carry one over one or even two bad years of famine. One good crop in six years is the average around Tatahouine.

Foum Tatahouine was created in order to keep the various tribes and towns at peace; to keep out the hordes of pillagers from Tripoli and the caravans of robbers from Ghadames and the south.

Thirty years ago each village was at war with its neighbor—a war to the death, where man, woman, and child were put to the sword and only the plunder, flocks, and beautiful young girls were carried away. Above all, the Toua-

Photo by Soler

PANORAMA OF FOUM TATAHOUINE

Showing large market-place, built by the French and Souks; also "Poste Optique du Tlalet," where before they had the telegraph they signaled to another "Poste Optique" near Médenine. House of the Cadi in left-hand foreground

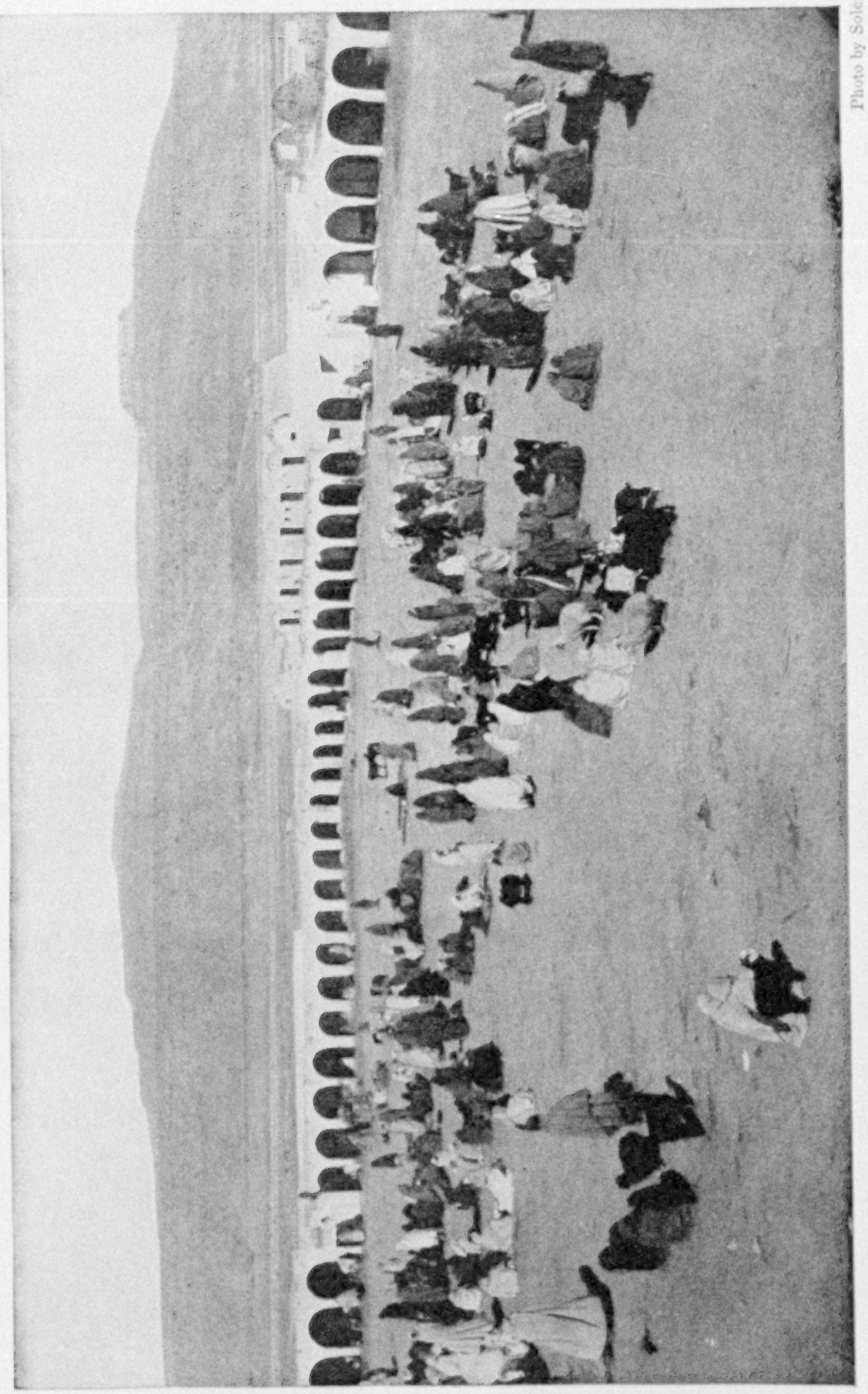


Photo by Soler

MARKET-PLACE OF FOUM TATAHOUINE: ALL THESE PEOPLE ARE TROGLODYTES

Photo by Frank Edward Johnson

BROADTAIL SHEEP AT THE MARKET OF FOUM TATAHOUINE

regs were dreaded. Mounted on their fast racing camels (mehari), they would swoop down and carry off everything they could lay their hands upon and vanish into the Sahara.

Today, thanks to the officers of the "Affaires Indigenes," a large market-place has been created not far from the military camp (page 833), and here on Mondays and Thursdays a huge market takes place, where deadly enemies of 30 years ago meet and sell and exchange goats, sheep, wool, grain, barley and wheat, olive oil, and all the necessities of life. Dwellings have sprung up around the market-place, most of them shaped like Rhorfa and inhabited by industrious natives from Douirat and Chinini, some southern Jews, and merchants of pottery from the island of Djerba.

Besides several deep wells, a new well has just been finished, built by the government. It cost all told 1,500 francs, including digging, pumps, and a lot of masonry work, which includes a large cistern, or reservoir.

This well is worked by Arab prisoners walking around and around pushing a capstan, four or five men in a gang; each gang works three hours at a time. From 11 a. m. to 3 p. m., owing to the great heat, the pump is stopped. Afternoons about half past four the women and nomads would come by the hundreds with their great water jars and goat-skin water bottles, and their horses, mules, and donkeys. Other prisoners were made to carry stone for building government buildings. The prisoners were serving time for minor offenses—thefts, fighting, etc.—and their terms of imprisonment varied from three days to one month. They seemed quite happy.

The semi-weekly market at Foum Tatahouine is a large affair; people come from all over the country to buy, sell, and exchange. Caravans come frequently from Ghadames, 466 kilometers

Photo by Frank Edward Johnson

THE TOWN OF SIDI-ABDALLAH BON GELIDA, BETWEEN FOUM TATAHOUINE AND DOUIRAT; WOMEN OF THE VILLAGE PULLING UP WATER

further south, bringing ostrich feathers, red tanned gazelle skins, leather cushions and embroidered slippers, and highly prized whips of rhinoceros hide. It is the great meeting place of the Troglodytes. The large market at Kebli, caidship of Nefzaoua, acts as a bourse and determines the prices over extreme southern Tunisia. A printed paper in Arabic and French gives the prices at Kebli from May 15 to June 15, 1911.

Sheep to be sold (1,000), 15 to 20 francs.
Lambs of this year (5,000), 8 to 12 francs.
Goats (5,000), 10 to 11 francs.
Young kids (5,000), 3 to 5 francs.
Camels (200), 100 to 150 francs.
Melted goat's butter, 1 franc 50 centimes a kilogram.

Prices of meat as I wrote these notes, May 20, 1911:

Spring lamb, one kilogram (equals 2 1/5 pounds), 65 centimes.
Goat, one kilogram, 42 to 45 centimes.
Mutton, one kilogram, 55 centimes.
Chicken, 85 centimes to 1 franc 25 centimes each.
One dozen eggs, 40 centimes.
One kilogram of bread, 40 centimes.
Forty liters of wheat (40 liters being an Arab measure), 11 francs 20 centimes.

Forty liters of barley cost 5 francs 40 centimes. A good mule costs from 300 to 500 francs; a large size cow, weighing from 100 to 120 kilograms, 100 francs; a horse, from 80 to 600 francs. Wool costs about 70 centimes a kilogram; olive oil varies from 75 centimes to 1.40 centimes a liter. Salt, tobacco, gunpowder, playing cards, and matches are monopolies in France and her colonies. In Tunisia salt is sold for 10 francs for 100 kilograms, equal to 225 pounds; table salt, 10 centimes a package of 200 grams; matches, 5 to 10 centimes a box; tobacco, the prices vary according to the quality.*

For game one finds hares, partridges, quail, and wild duck; gazelles and "mon-

*One franc equals 20 cents; 100 centimes make one franc; so 5 centimes is equal to one cent of United States currency. Eight kilometers equal 5 English miles; 1 kilometer 5/8 of a mile; 1 liter equals a trifle over one quart; 1 kilogram equals 2 1/5 pounds.

Photo by Soler

GENERAL VIEW OF THE TROGLODYTE TOWN OF DOUIRAT: "CLIMBING" TROGLODYTES. ARAB CEMETERY AND OLD MARIBOUTS IN FOREGROUND; "IT LOOKS LIKE A BEEHIVE" (SEE TEXT, PAGE 839)

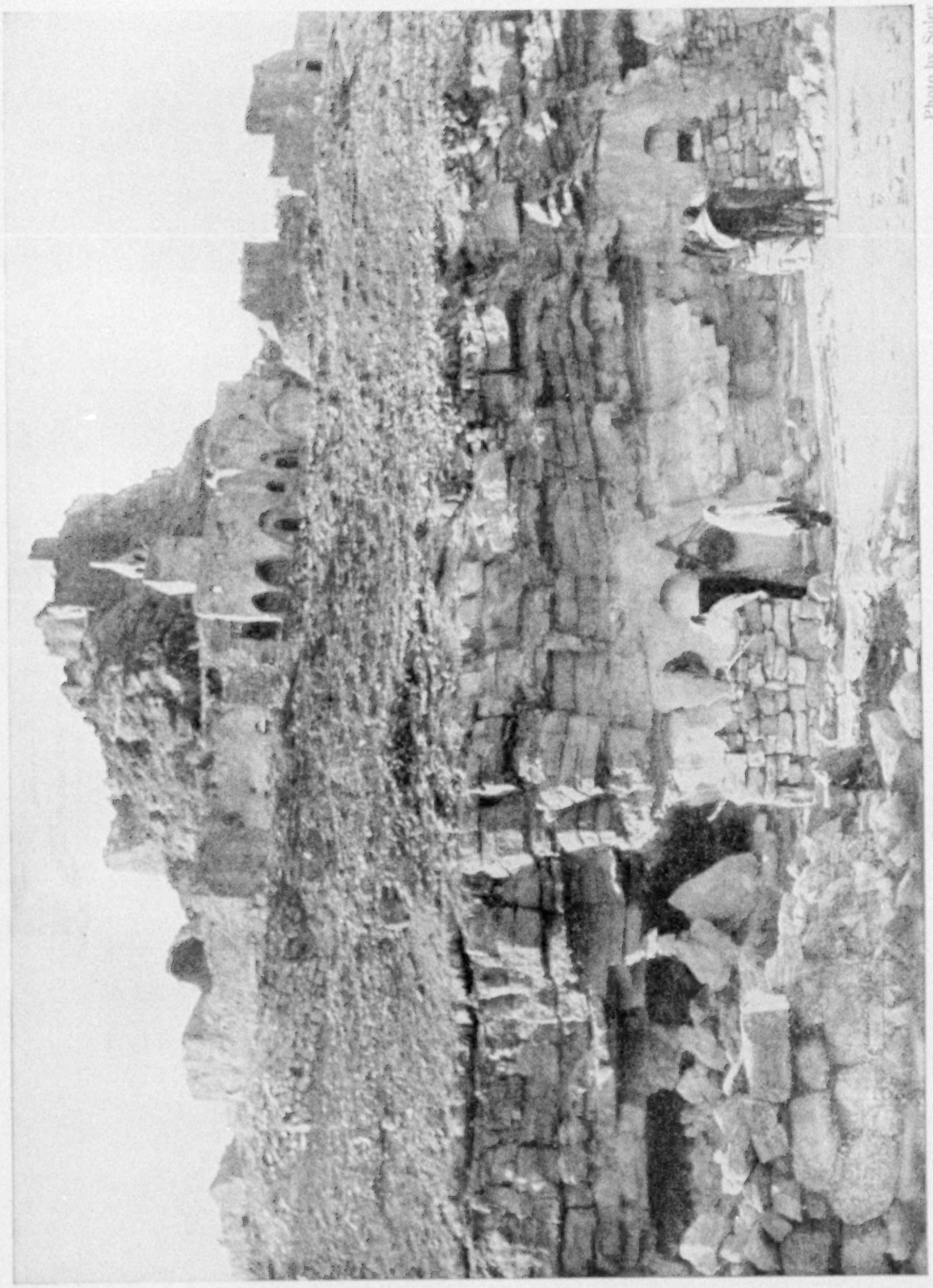


Photo by Soler

ANOTHER VIEW OF THE TROGLODYTE TOWN OF DOUIRAT, SHOWING MOSQUE AND STRONGHOLD, NOW FALLING RAPIDLY INTO DECAY

Photo by Frank Edward Johnson

MOHAMMED ON HIS HORSE, NEAR CHININI: OBSERVE THE ROCK STRATA

flon" (a species of big-horned sheep), hyenas, and jackals. White, yellow, and black scorpions abound; also numerous snakes and vipers, one called "the horned viper" being particularly deadly.

Horses and mules were brought me to select one for my long journeys. I chose a large, strong mule about five years old that had the worst temper imaginable, but could outrun the cadi's pet stallion and climb mountains like a goat. My selection proved a wise one, for Mohammed's horse fell twice and was badly hurt, and Brabisch had to use a second horse, his was so hurt by a fall at Guermessa. Brabisch was the son of the

Photo by Frank Edward Johnson

ON THE TRAIL BETWEEN DOUIRAT AND CHININI: MOHAMMED, BRABISCH, AND A SON OF SIDI HADJ

The boys have on the large straw summer hats worn all over extreme southern Tunisia

caliph of the tribes of Ourdana and the inseparable chum of Mohammed. The caliph confided his son to me during my journeys into the mountains.

A great quantity of food and provisions having been sent ahead with servants and Ben Sada, the cook, we started out one day for the Troglodyte town of Douirat. It took a long time to get started, as Mohammed insisted upon making some new cartridges. Every one goes fully armed, "to shoot quail," they said. Our trail passed through the lovely oasis of Foum Tatahouine and up the oued. Nothing but rocks and stones everywhere. About 8 kilometers from Tatahouine we visited a walled-in town of Rhorfas, looking like a small Médenine. It was silhouetted against the sky on the top of a hill. A great well was at the base of the hill and nomad women were drawing up water for themselves and their animals. The town was rather large and well preserved.

About 4 o'clock we came into the grateful shadow of the mountains, and our trail wound up and down precipices and was extremely wild. Coming out on top of the mountain range, we had an extensive view—a sky of azure blue, pinkish, purple mountains, and great stretches of golden sand, relieved here and there by tufts of silvery gray sage brush.

Several kilometers further on the trail opened out on a valley containing patches of barley and some fine olive and fig trees, and just before sunset we came to Douirat. It is difficult to describe and very bizarre—like a beehive mountain perched high over a deep ravine (picture, page 836). The village extends for about two kilometers; everywhere are caves and niches; in many places the trail zigzags up, and there are tiers above tiers of human Troglodyte dwellings. Above all rises the huge "ksar," or citadel, now a mass of ruins. At the foot of the ravine is a Troglodyte cemetery,

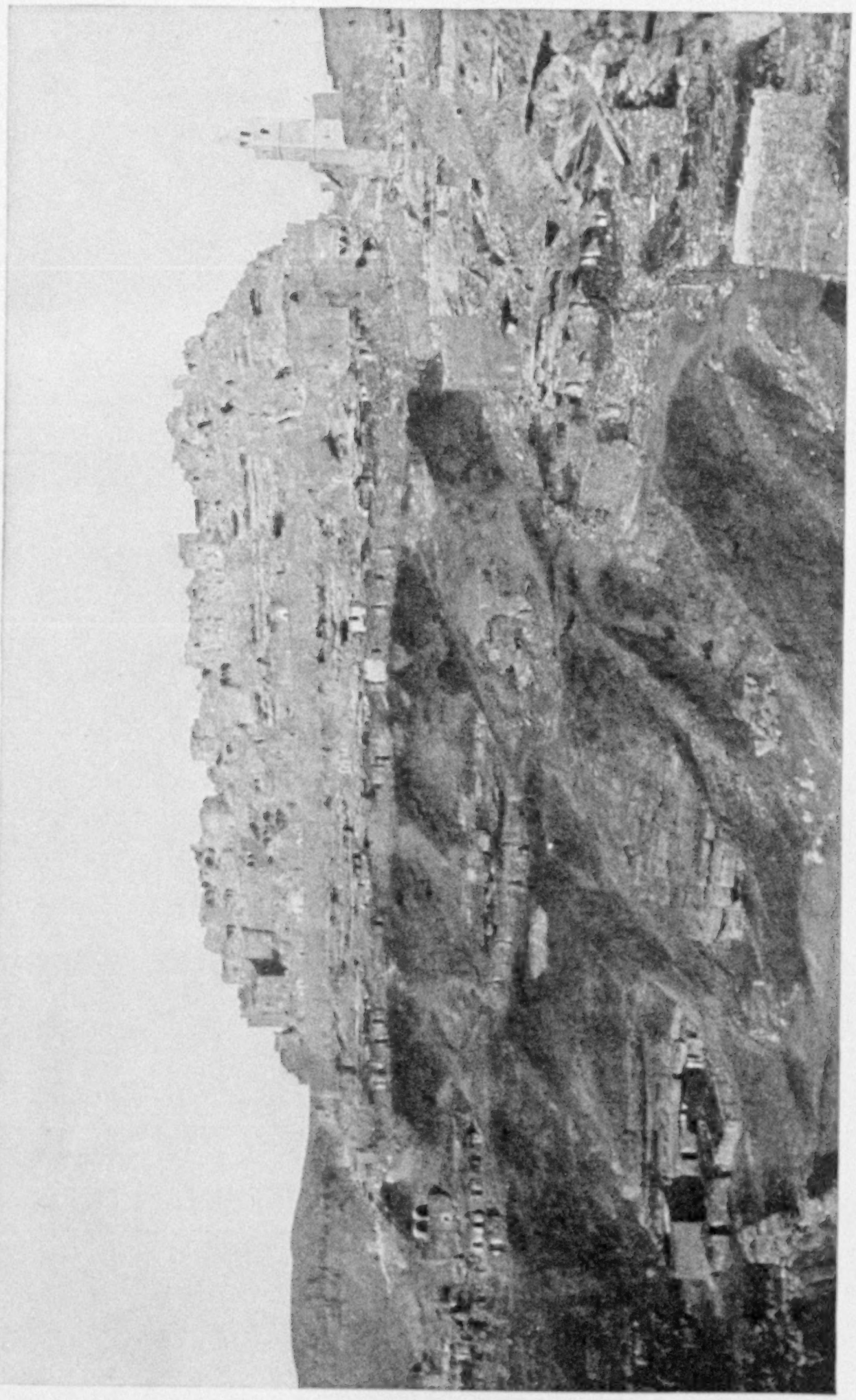


Photo by Soler

THE TOWN OF CHININI (DJEBEL CHARETTE), SHOWING "KSAR" OR CITADEL, MOSQUE, AND CAVES OF PRESENT INHABITANTS

Photo by Soler

ENTRANCE INTO THE TROGLODYTE TOWN OF CHININI (DJEBEL CHARETTE), WITH MOSQUE IN FOREGROUND AND KSAR IN BACKGROUND

Three-quarters of the town lies back of the place where the photograph was taken

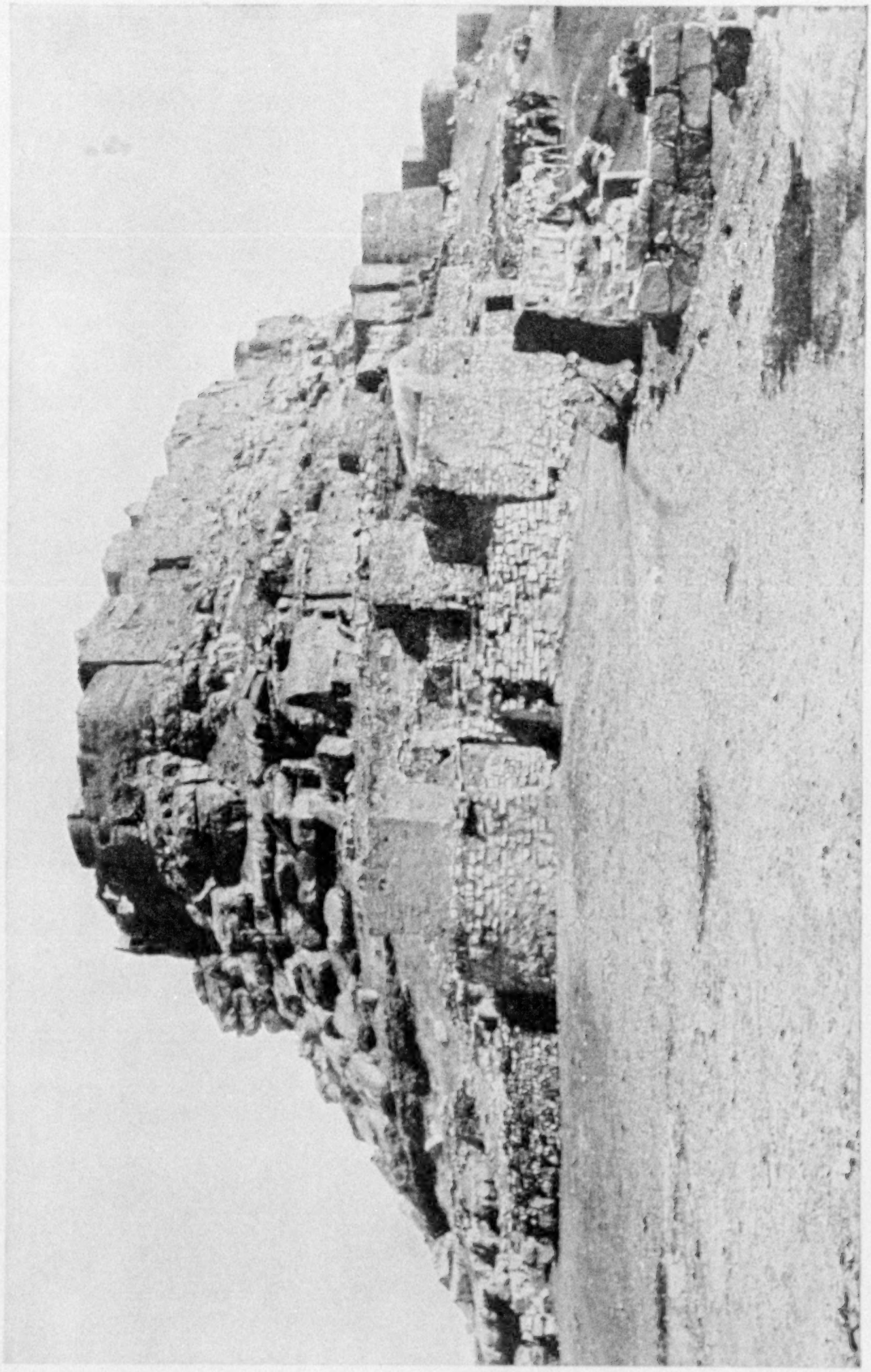


Photo by Soler

THE KSAR OF BENI-BARKA

with several fine old maribout tombs crumbling to pieces. It reminds me of a huge human ant hill turned into a mountain and the ants the Troglodytes.

The sheik and headmen of Douirat, with Ben Sada and our servants, came out to meet us, and many were the glances cast at me, for they tell me that I am the first American ever seen. The sheik's cave had been arranged as a dining-room for us, and there were native and Kairowan carpets on the stone floor, and chairs and a table had been brought from somewhere. We took a walk through the town, but were glad to return to the cave, as there was a sharp wind. The changes from noon to midnight at Tatahouine average 22 degrees, and it is far more in the mountains.

A large wooden bowl of cous-cous was brought in that had been made by the women of the sheik's household, much to the chagrin of Ben Sada. Cous-cous is an Arab dish that one finds all over northern Africa. It is made of wheat prepared in a certain manner, so that it looks like very fine round grains of rice. It is boiled soft with vegetables, when they are to be found, and served with half or a whole sheep. It is highly seasoned with red peppers and is an excellent and nourishing dish.

Mohammed, Brabisch, the sheik, and I sat at the table. One's hands are washed just before eating and a wooden spoon is given to each. The host or his eldest son cuts the sheep into pieces with a hunting knife and all fall to. The great wooden bowl is placed on the floor or on a table about six inches high, with the men sitting tailor fashion around it. Each one eats out of the huge common dish, and choice bits of mutton are placed in front of one's portion by the host or his friends. With me there were knives, forks, plates, and goblets and linen napkins sent by the thoughtful cadi. In vain I protested. Ben Sada had orders that he carried out like a soldier.

Our table talk was, first of all, how I liked their country—was it not beautiful; had I ever breathed such air, or tasted such wonderful water, or seen finer olive trees? Then they would tell me of their pilgrimages to Mecca and details of the life of Mohammed and his leaders. Finally, they would want to know just where America was situated. On a voyage to Mecca the captain of the steamer had told the sheik that if he kept on through the Suez Canal, Red Sea, and past India and the Far East that he would reach America. That was clear to the sheik's mind. Another pilgrimage to Mecca and another captain on the return voyage told the same sheik that if he kept on past Tangiers (Morocco) and Gibraltar he would reach America; that was too much to believe.

Being a member of the National Geographic Society, it was my duty to enlighten these Troglodytes where our glorious land was situated. As we were in a country devoid of fruit and no toys, so that oranges, apples, or a ball were impossible to find, I joined two cous-cous plates together and explained on this improvised globe where Tunisia and northern Africa were; then Mecca and India. I did not imitate Columbus and use an egg, because Ben Sada had used all there were to make a succulent "chak-chuka," a native dish of eggs and lamb fried in olive oil with plenty of tomatoes (dried in pieces) and red peppers.

I am going to send a globe to my friend the cadi and some maps. Once or twice a month the sheiks of the different towns come to the large market to Foum Tatahouine and they are to learn geography in a practical way.

Mohammed and Brabisch go to school and study geography. Wherever I am or have been, a pin with ribbon is to be placed on the map to indicate, and they already have quite a collection of picture cards of America and France.

Of my first night in a Troglodyte cave the less said the better. The cave was cut out of soft rock about three meters wide and ten meters long and a little over two meters high. The floor and ceiling were strata of harder rock. The only light came through the sarcophagus-shaped doorway.

On one side of the cave stood huge pottery jars filled with olive oil. They were large enough for the forty thieves

of Ali-Baba to have hidden themselves in. In a niche were large wooden chests, and the usual collection of firearms hung from the rock wall. At the rear of the cave was another cave that served as a storehouse for saddles, wooden plows, gourbis, and household articles. Judging from the sounds, this second cave must have communicated by means of a tunnel with a subterranean stable, where the horses, mules, and donkeys were kept, for I heard the snarling of camels, the bleating of goats, and the constant barking of dogs, and it seemed as if all the fleas of Tunisia were jumping over me. My bed consisted of two Kairowan carpets and my steamer rug that served days as a saddle blanket.

From Douirat to Chinini the trail is very bad and slippery. The mountain sides are covered with esparto-grass. We passed superb large olive trees that the natives told me were the shoots taken from the olive trees planted by the Romans. Fig trees seem to thrive also.

As we neared Chinini we saw a very large and picturesque maribout to the left of our trail. To the right was a vast desert of sand and stones. The heat was great, and it was a comfort to dismount and take shelter in one of the caves of the sheik, which was particularly clean and attractive. It contained the usual arsenal of guns and pistols, cous-cous plates and covers, a Persian picture of the kaaba at Mecca, for the sheik had been there, and an assortment of Touareg cushions and decorative rugs from Kairowan and Persia.

The water for Chinini has to be carried from a well in an oasis of palm and olive trees over three kilometers from the town, situated down in the valley. It is brought up by the girls and women in great pottery jars or carried up in specially prepared goat skins on donkey back.

The dwellings of Chinini (pictures, pages 840-841) resemble those of Douirat—great caves dug into the mountain side and courtyards and small buildings of masonry in front of the caves.

Perched high above the rest of the town was the ksar, fortified citadel and storehouse in times of siege, fast tumbling to ruins, like all the other Troglodyte towns.

Some of the French officers have divided the Troglodytes of extreme southern Tunisia into three groups:

1st. Troglodytes that live under the earth, like Matmata.

2d. Troglodytes that live in caves or dig holes in the hillside.

3d. Climbing Troglodytes, such as we have seen at Douirat, Chinini, Bini Barker, and Ghourmessa.

Since I have visited them all and studied them in their homes—slept, eaten, and lived among them—it seems to me they are all originally climbing Troglodytes who have adopted the dwelling and abode best suited to their wants. Almost all of the Troglodytes are semi-nomads, and leave their mountain homes to wander in the plains and deserts that extend from their mountains to the Mediterranean, or pitch their gourbis on some mountain side far away from any village, where their goats and camels can find something to eat.

A number of men had come over from Ghourmessa to meet us and escort us to their towns, so that about 20 persons dined after us at Chinini. Many were the stories they told of feats of valor and bravery, of wars against Douirat and the other Troglodyte towns. The sheik told us how 20 years ago, when a woman went to fetch water from the well, five or six armed men had to go with her, and that at night 12 or 15 armed men patrolled the town lest men from another village would attack them. When attacked all the inhabitants would flee to the ksar, where the walls were very thick and where provisions of grain, olive oil, and water were always kept on hand. Some of these ksar have walls from six to ten meters thick, with one small gateway, where only one man can crawl through at a time, and the rhorfas are built one upon another to a height of from six to ten stories. One climbs up by means of projecting stones stuck in at random.

The sheik asked me if I had noticed the guns of the Caliph of Foum Tata-

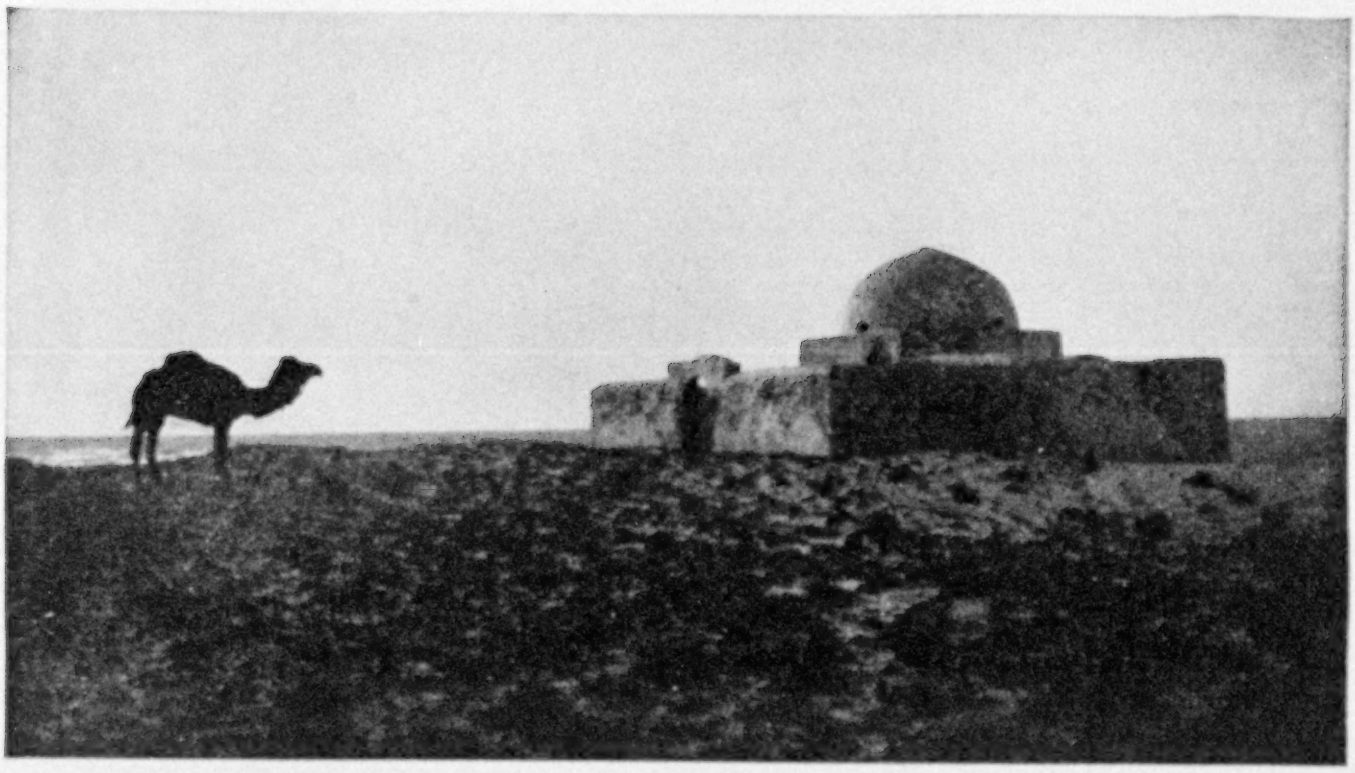


Photo by Marie Helms

CAMEL AND MOSQUE: THE MAIN THINGS IN AFRICA

houine, one gun in particular, when I had dined with the caliph the week before. On the stock of the gun were 100 small cuts. Each cut meant the death of one of the enemy by a shot of the caliph's gun.

I understood now why Brabisch, that roguish, lovable boy, was such a deadly shot with his gun. Woe to the pigeon or hawk that flew across our trail. Off would tear Mohammed and Brabisch at full gallop. Bang! would go the gun and down flutter the game.

These men of the mountains are true sports, according to their code.

Ghourmessa is situated on the top of a sugar-loaf mountain with the point cut off. It dominates all the surrounding country, and is the wildest and most difficult of access. Its inhabitants are a warlike race, not friendly to strangers.

We were the guests of Sidi Hadj, a great friend of the cadi. He and his five sons had come half way to meet us. They are all married and have Troglodyte homes of their own, unlike the tribes around Matmata, where the head of the family lives with his wives, his sons, and his sons' wives and children in one of those large dwellings dug out of the earth. An Arab, no matter how old, is subject to his father, and cannot travel or do much without his father's permission. When a Mohammedan has been to Mecca he is called Sidi Hadj, and the more pilgrimages he makes to Mecca the more holy he becomes. Sidi Hadj had been three times and wore a green turban, showing that he is a direct descendant of "the Prophet."

Never shall I forget the sunset scene from the entrance of Sidi Hadj's cave. A narrow path ran in front, and from its edge one could drop a stone hundreds of meters down to the plains below. Mountain ranges stretched all around us, but to the southwest lay the Sahara, a golden reddish sea of sand and colors no man can paint and hardly imagine. A sirocco had been blowing all day, and the fine dust in the air turned the sunset colors into green, with ribbons of gold and purple. We all sat spellbound; no one spoke. The colors dimmed and faded into blue. Far below on the horizon were the tiny camp-fires of some nomads preparing their evening meal. Above us the stars came out one by one and formed "the dipper" upside down.

Ghoumrassen is another of the impor-

tant Troglodyte towns, of about 3,000 inhabitants. Its caves seem larger and deeper than any others that I visited.

The Sheik of Ghoumrassen had just finished an addition to his dwelling. He had hired men to excavate an inner cave 13 meters long by 4 meters broad and about 3 meters high. It took seven men not quite one month to cut it out of the solid rock. These caves have several good points. Rats and mice and insects cannot get in, and there is no danger from scorpions or vipers, and they are delightfully cool on a hot day and warm on cold nights.

My adventures with my two devoted friends, Mohammed Ben Cadi and Brabisch Ben Caliph, would fill a book. They escorted me to every known and unknown Troglodyte town, village, or cave—Beni-Barka, Guetofa, and Gedini, and a score or more of places hidden away in some mountain wilderness. Thanks to them and the Cadi du Djebel-El-Abiodh, whose thoughtful kindness I can never repay.

In closing, let me say that the majority of French officers stationed in the out-of-the-way places of northern Africa are a splendid set of men, whom it has been a pleasure and privilege to meet—men in the highest sense of the word, doing their duty and putting heart and soul into their work. It is owing to these almost unknown men that Tunisia has made such great progress during the past 30 years. These men of war turn to agriculture and teach the Arabs how to improve their olive trees; how to graft new life into old trees; how to breed better cattle and horses; to raise more barley on their dry soil; make plans for piping water and digging wells; turn doctor and heal their diseased and suffering families. In short, bring order and system out of chaos, establish schools, law and order, and make peace reign where 30 years ago was rapine, fire, and sword.

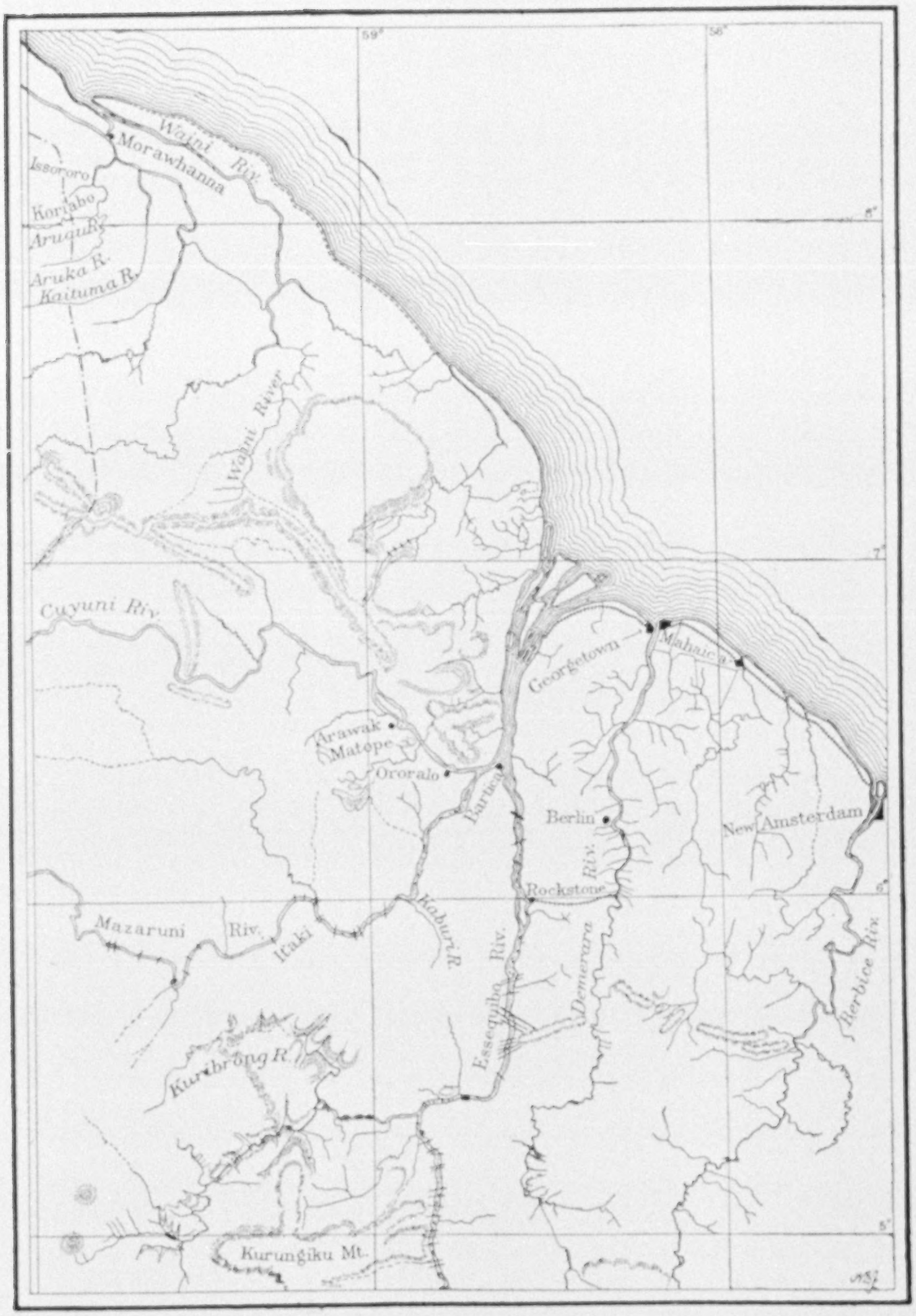
THE WORLD'S GREATEST WATERFALL: THE KAIETEUR FALL, IN BRITISH GUIANA

By Leonard Kennedy

MY INTENTION, when I left New York as one of two passengers on the steamship *Suriname*, of the Royal Dutch West India Mail Line, was to spend a short vacation out of the way of things. My ticket read to "Georgetown, British Guiana," and that was almost all I knew about it. The day previous I had met a gentleman from Georgetown, who had advised me to make that city my destination. "It is interesting," he said, "and there is a waterfall back in the bush worth seeing. Discovered 40 years ago, it has been visited very seldom. I think I am the only man in America who has seen it, yet it is five times as high as Niagara and ranks in magnificence with anything in the world."

So I landed in Georgetown indefinitely expectant. As a traveler with some experience in hidden Europe, I planned to loftily present an omnipotent dollar to the "concierge" and allow him to make the arrangements for me to start inland the next day. I was disappointed, somewhat agreeably, to find that the type was unknown. There were no pleasure-seeking tourists and so no concierge. I fell back on a letter of introduction to a hustling young American named Crane. "I'll put you through," he told me, "though I have no idea how."

Together we found a man who had made the trip. He was a rarity, even in Georgetown. "Sproston's," he informed us, would get me as far as Potaro Landing, and after that Indians were best. Sproston's, I learned, was the transportation company of the province and an institution of tremendous importance



OUTLINE MAP OF BRITISH GUIANA

where the rivers are the only highways. Like most of the men I met there, Mr. Goring, the manager of Sproston's, was willing to do anything he could to help me. He was skeptical, but promised to write to his agent on the Potaro and ask if there was any one there who would take me to Kaieteur Fall. This he immediately did; but things go slowly on the frontier, and it was more than a week before he received an answer.

Meanwhile I had a chance to become acquainted with Georgetown. It is a comfortable place, kept cool by the steady trade winds and well governed, as British colonies are. The streets are wide, and through the center of many are canals filled with enormous Victoria Regia water lilies. Back from the street, and usually behind a row of stately palms, are the peculiar "peek-a-boo" houses. The only familiar edifice was a Carnegie library of the standard type. The rest of the buildings were usually of wood—of pine, by the way, from our Northern forests—and raised high on piles, for the whole city is below the level of the sea and a ground floor would be unhealthful for habitation. Beside almost every house is a cistern, into which the rain-water from the roof is drained. This provides the only source of pure water, but so regular are the rains that there is never a moment of worry about the supply.

The people are without doubt the most interesting sight in Georgetown. There are as many types as there are illustrations in a text-book on anthropology. African negroes, coolies from India, Portuguese, Chinamen, native Indians, and the English form the constituent parts. Intermarriage has complicated matters, so that types of faces, dress, and even religions have increased by geometrical progression into a hopelessly intricate sociological mess. I met one lady of good social standing who was a Dutch negro Jewess, while a coal-black Chinaman with curly yellow hair walked in the streets unnoticed but by me. It was most amusing to hear these various types talking to one another in the broadest London accent.

Even the monetary system is a half-breed affair. Prices are quoted in American dollars, yet the coins are English and a shilling is 24 cents. There are colonial bank notes marked $5, though worth only a pound, and there are silver four-penny pieces descended from the old Dutch "bit".

The town itself does not wear well, for the amusements are few. The botanical garden is said to be one of the most beautiful in the world, just as similar gardens in Java and Ceylon claim the distinction. A drive is interesting along the old sea-wall, which was built by the Dutch when they settled there and the British were in possession of what is now Dutch Guiana.

I was glad when an answer finally came from Mr. Goring's inquiry. An Indian named William Grant was ready with a crew of six men to take me from Potaro Landing to the fall. I was surprised at the name "William Grant," but I later learned that the Indians have several sets of names, graded according to intimacy. To tell a white man their native names would be to give him power to call down the devil on their fortunes.

I arranged to close the contract with Grant at once, and began to make my preparations for the trip. It rains pretty much all the year round in Guiana, very hard and very suddenly, so that several changes of clothes are essential. Likewise I had to carry 10 days' provisions and all the necessities for sleeping in the bush. It was no easy matter to judge of the right things for such a trip, and I constantly turned to experienced advice. Woolens, for example, do not sound logical within a few degrees of the equator, but fortunately I was persuaded to wear them. They absorb the moisture both from within and without, and so prevent the chills that are usually followed by malaria, where that disease is always in the air. It is never insufferably hot in Guiana; in fact, very rarely even uncomfortably so, if one avoids violent exercise. All the year the temperature stays about the same, and I must admit that for a short visit the cli-

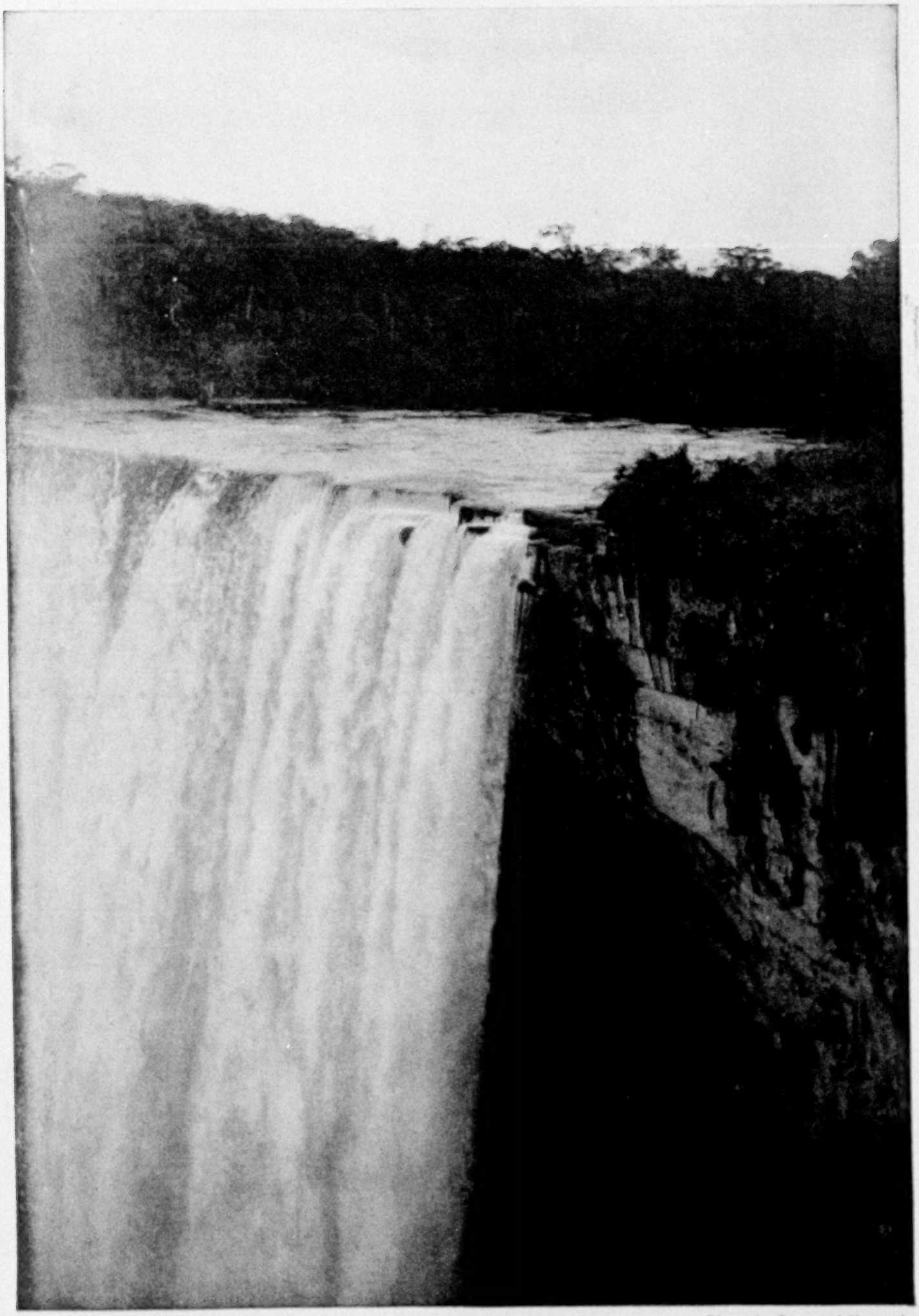


Photo by Leonard Kennedy

ONE SIDE OF KAIETEUR FALLS FROM THE EDGE OF THE CANYON: BRITISH GUIANA

Photo by Leonard Kennedy

LOOKING ACROSS POTARO RIVER AT THE BRINK OF KAIETEUR FALLS: THE RIVER IS 369 FEET WIDE AT THE BRINK

mate is a great relief from the extremes of our Northern States.

On a beautiful Monday in August I started from Georgetown on a small steamer up the Demerara River. Beside my kit and provisions I took with me a negro boy to cook and in my pocket letters of introduction to Sproston's agents along the first part of the way.

The Demerara flows through a low flat country of alluvial mud, so that the tide can be felt 80 miles from the mouth. At Georgetown it is so shallow that the steamers entering the port literally plow through the mud and at full speed barely crawl to their wharves. Forty years ago a vessel was wrecked off the coast of Guiana, and the mud has built around it until today it is an inhabited island covered with tall palms. Just outside of Georgetown the river steamer passes the big sugar estates established long ago by grants from the Crown. They are worked by coolies brought over from India, but they seem to have passed their age of prosperity, and the tall brick chimneys on many of them have been left to crumble. Further on the country grew wilder and we passed between shores thickly covered by the jungle. To be sure, this jungle is not true to the pictures in the children's geography, in which birds, monkeys, lions, and a rhinoceros or two peacefully pose in a group for the artist, but the Guiana jungle is, nevertheless, the real thing.

Now and then we would come suddenly upon an arch in the trees, through which I could catch a glimpse of a clearing and a tiny house thatched with palm leaves. In such a home the contented coolie, who has served his five-year term of indenture on the sugar estate, lives in plenty—I cannot imagine how—the rest of a peaceful life. It was very amusing to notice that even in these isolated oriental settlements in South America Monday was celebrated according to convention. The week's wash, scant to be sure, was displayed conspicuously everywhere. Occasionally one of these lagoons in the forest would present a busier scene, and several dugouts would come out to the steamer to take off freight or mail. Then the captain would tell me that behind there they made charcoal or grew cocoa, as the case might be.

So the day passed from 8 in the morning till 5 in the afternoon, when we arrived at the steamer anding at Wismar.

The town was a tiny place, consisting of the landing stage, a railroad station, a store, a gin shop, and half a dozen huts. But the fact that it is the terminus of the Demerara-Essequibo Railroad gives it some activity.

This railroad connects the two most important rivers of the province. It is, of course, narrow-gauged and poorly built, but any sort of railroad is a blessing in Guiana. The line runs over ground as sandy as a beach—and indeed that is what it used to be. All the country below that point has been built out into the ocean, just as the island was built from the schooner's wreck. The stations were marked by signs and by one house apiece. There was apparently no trail leading anywhere, and no one ever started away until after the train left. I was told, however, that these stations are the centers of a hard-wood lumber trade which the railroad company itself carries on.

Rockstone, the Essequibo terminus of the road, was hardly more imposing than Wismar. The bank of the river here is a rather indefinable line between a swamp and the shallow water. The track is built on an artificial embankment, and a surprisingly good hotel was at the time approachable only by a bridge. It had been built in the more palmy days of gold-digging and on its register were names from all over the world. On the two nights I stayed there I was the only guest.

At 6:30 on Tuesday morning the launch started for Tumatumari, and all day it fought against the current between the monotonous shores. As a matter of fact, I hardly once saw the shore itself, for the bush is so thick that it grows out into the river, leaving only lagoons by which the interior can be reached.

It surprised me to find the Essequibo such a formidable stream. I had always considered the Hudson something of a river, but the unknown Essequibo drains five times the area and is twice as long.

Early in the afternoon we left the great river and entered the mouth of the Potaro, itself a stream of no mean proportions. A few hours later Tumatumari, a tiny habitation built on a hill by the side of a cataract, hove in sight. We landed before sunset. I understood it was exactly 6 o'clock, but I later found out that it is always 6 when the boat arrives. The only reliable watch of the village belongs to the agent of Sproston's, who takes great pride in the promptness of the launch.

Upon landing I presented letters to the Chinese storekeeper and to the government agent, a young man named Christiani. The latter put me up in his attractive bungalow. His hospitality was of a sort that one rarely finds off the frontier and I was sorry to leave him early the next day.

There was a hut in the village which interested me. A good deal of American oil is used in the colony, imported in tins, which in turn are boxed to keep them from denting. The hut which drew my interest was walled by these boxes and roofed with the tins. This was merely an example of the use to which "tidewater" tins were put, for they are an article of standard value throughout the colony.

At Tumatumari I met my crew of seven Indians. Grant was the only one of them who could speak English, but they were a splendid lot, just civilized enough to be willing to work for a white man and still unspoiled. Taking them in the launch with me I reached Potaro Landing at noon. We cooked our breakfast on the clearing in front of the storehouse, for the landing is absolutely the last river settlement and it does not afford a rest-house or even a store.

After our meal the Indians strapped the boxes of provisions on their naked backs, and we started on a seven-mile tramp through the bush to a spot dignified by the name of Kangarooma. The river above Potaro Landing turns at a sharp angle and is blocked by a cataract. By walking across we shortened the distance and portaged the fall.

On the march we used every precaution against poisonous snakes. We actually came across only one, which we carefully avoided. I carried with me some strong ammonia as well as a sharp knife and a bandage, for although the dangerous snakes are rare one must be prepared in case of an attack.

I am thankful to a defunct rubber company for the accommodations they have left along the Potaro. At Kangarooma there is a clearing, now overgrown with thick underbrush, and a house of galvanized iron, where I hung my hammock on Wednesday night. There are drawbacks to such shelters in the jungle, however. The bats and spiders which had made this hut their home were not at all compatible to my temperament. I found myself dreaming of them in the night.

All the boxes could not be brought over from Potaro Landing in one carry, so the next morning was spent in finishing the job. It was not until 2 o'clock that we started again.

The boat that we found at Kangarooma was a flat-bottomed punt that leaked badly, but it held us up and made some headway against the strong current. The boxes were piled in the middle and a large piece of canvas which we used for a shelter at night made a comfortable seat for me on top of them. Grant, standing in the stern, held a large oar with which to steer. The other six took their position along the side, with one in front of the others to set the stroke. It was a peculiar stroke, as if they were digging holes in the water, using the paddles on the side of the boat as a lever. Between the strokes they would touch the middle of the oars on the gunwale, so that they could keep in time by the sound. Every minute or so the bowman would splash the water high in the air and follow by a half stroke to vary the monotony. It was slow work, but by keeping it up all day the curves in the river changed before and behind us, and so I knew that we made headway.

That night we camped by the side of the river, spreading the great tarpaulin above us for a shelter. The Indians were wonderfully skillful in woodcraft, and it was amusing to see with what scorn they watched my negro cook making a fire out of wet wood.

By 6 the next morning we had our coffee and were off again. Sticking close to the bank to avoid the current, it was, nevertheless, a hard pull, and once the men got out into water up to their waists and dragged the boat through some rapids. I was afraid one of the big alligators which we frequently saw along the bank would be tempted to take a bite of them, but fortunately no such accident occurred. Fish are more dangerous. One variety numbs by an actual electric shock and then feasts on the body of its victim. Another sort is fitted with the sharpest enameled teeth and can bite off a finger or toe at a snap. There is likewise a fish whose sting is dangerous.

We reached Amatuk Falls in time for breakfast and made the portage by noon. The falls are not high, but I clambered out into the rocks in the middle of the river and had a very pretty view of them, with the water roaring about my feet. We passed on by 1 o'clock and the chug and click of the paddles continued up the river. By 6 we had come nearly to the next portage at the Waratuk Cataract. The darkness comes abruptly, however,

Photo by C. H. Eigenmann

ANOTHER VIEW OF KAIETEUR FALLS

and it is very difficult to make camp after sunset, so wherever we were at the proper moment we made preparations for the night.

A lantern always hung by my hammock while I slept to keep away the vampire bats, and by its light the Indians used to begin the morning chores. The dawn breaks as suddenly as the night falls, yet they always seemed to know just a few minutes before that it was coming. It was generally 5:30 when we climbed out of our hammocks for coffee.

On Saturday morning we were away early and within two hours we reached Waratuk portage. The cataract here has no straight fall. For 100 yards it rushes down over great rocks in a seething turbulence which would defy the staunchest boat. At this point the only real hitch in the expedition occurred.

The third of the defunct rubber com-

pany's boats was supposed to be at the head of the portage, but no boat was to be found. Evidently some Indian with a grudge against the white man, or perhaps the flood of the river, had carried it over the rapids. On our return we found a shattered fragment down the stream.

My first thought was that it would be possible to walk the remaining distance to Kaieteur; but Grant had seen me blundering across the slippery saplings that bridged the frequent streams from Potaro to Kangarooma. He informed me that the Indians might do it, but for me it was impossible. Fortunately, he knew where two dugouts were, 10 miles up the stream and on the other side. So I sent four of the Indians in search of them, while the rest of us settled down as comfortably as possible to await their return.

Unlike the negro, the Indian does not like to be idle. The three who remained with me at once set to work bleeding balata trees in the neighborhood of our camp. Balata is an inferior species of rubber and forms one of the chief exports of the colony. In each tree several long slashes were made at angles running into each other. A gourd was fixed at the bottom as a receptacle for the gum. In this way they gathered several pounds of the raw balata, which they presented to me.

Not until the next morning did the Indians return. There had been some hope that they would find the large boat, but they came back with only the two dugouts, which they called "curyalls". It was therefore necessary to leave a base at Waratuk and, with four of the Indians and only necessities, cover the remaining distance.

We lost no time in starting. In the center of one of the unsteady little shells were placed a tarpaulin, a box of provisions, and the hammocks, while in the other I carefully seated myself. An Indian in the bow and stern of each had no trouble to make himself comfortable. By the time the shadow of my broad-brimmed hat formed a circle about my feet we were off. We managed the rapids beautifully in such shells, and our speed was a great improvement over that of the clumsy boats we had been using. Before we had paddled 15 minutes we turned a bend in the river and Kaieteur appeared far in front of us, a narrow white dot against the green foliage and blue sky.

From that point on the gorge through which the fall has cut its way during the ages opened up more clearly. Massive precipitous rocks rose out of the jungle beside us as sharply as the sides of a Norwegian fjord. Suggestive also of the Scandinavian fjords were the lace-like waterfalls that came tumbling down from these heights.

It was a hard journey in our tiny boats through this imposing canyon to the rapids known as Tukeit. Here, through some freak of nature, there is a clearing by the side of the river, the first break in the forest I had seen since leaving Kangarooma, four days back. We easily knocked a temporary shelter into being and made ourselves at home for the night. It was a swampy home and smelled of malaria, but I took a double dose of quinine and slept well.

The rain fell in torrents in the night and one of my Indians suffered from his exposure the next day. My only discomforture lay in the fact that I had left my cook at Waratuk. The Indians did their best to help me, but their cakes of plain flour and water made into a dough and very much under-cooked did not tempt me. I lived on cold corned beef from Chicago and Uneeda biscuits, washed down with muddy coffee and condensed milk.

From Tukeit it is four miles in a straight line to Kaieteur, but the valley through which the river flows is quite impassable. Huge boulders block the way, and, as far as I know, no one has ever reached the bottom of the fall. Our route lay up the steep side of the gorge along a trail which I could not recognize as such, but which to the Indian is the highway to Brazil. With no idea of zigzagging up the side of a mountain, the Indian has applied the principle that a straight line is the shortest path between two points, no matter what the angle.

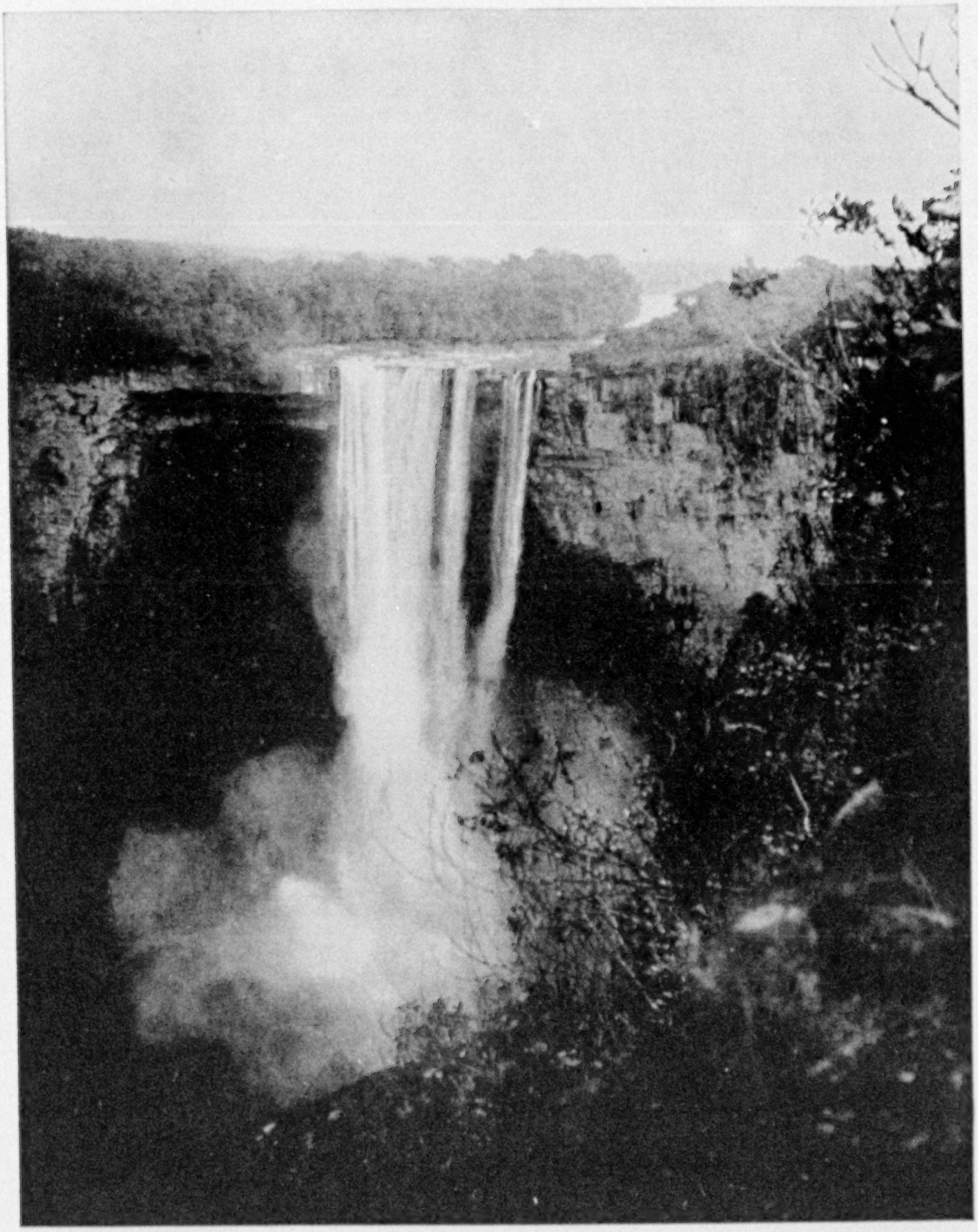


Photo by C. H. Eigenmann

THE EVER-CHANGING SHAPE AND MISTS OF KAIETEUR FALLS

The journey resembled climbing a ladder of stone.

Once, on our way, we crossed a stream that tumbled down over a bed of smooth rock. Along its course monoliths of very regular formations added to the picturesque view. I stopped to admire the sight, glad of a chance to rest. Never have I been so hot as I was on that climb. One does not realize the debilitating heat of the tropics while sitting still in the breeze. But the violent exercise, laden down as I was with my share of the burdens, brought every particle of heat in my body to the surface. I found that the perspiration was running off the ends of my fingers and shaking from my face with the jar of every step. The stones under foot were moist and slippery, and considerable extra muscular effort was needed to keep a firm footing and avoid a fall. All the time we remained in the jungle. Only once, by going out of our way, did we catch a glimpse through the foliage of the other side of the ravine.

It was a great relief when I finally sat down on a fallen tree at the top of the gorge and called for water. We had halted at the edge of the small savanna that borders the bank of the river at this point. Out on to this sandstone plateau Grant went with a saucepan to get me a drink. In a minute he returned, bringing me a cup of liquid the color and temperature of tea. Protest was useless. It was a 20-minute walk to the river above the fall, and meanwhile the only water obtainable was from the shallow pools in the rock, where the sun had beaten down upon it for hours.

I was eager to reach the fall. Leaving the others behind to make camp, Grant and I, armed with my camera, and the umbrella for shade, started at once. The edge of the jungle is abrupt. A few steps brought us out on to the Kaieteur savanna. This interesting plateau, covering not more than a square mile, is a barren stretch of level sandstone. A fibrous plant, very much like sisal, and an abundance of rare orchids are about all that thrive on the wet rocks. Scraggy bushes struggle along in the hollows, where a little soil has collected, and impede the otherwise easy walking. From this savanna we had an opportunity for the first time to look out over a wide stretch of country. In the purple distance to the southwest we saw mountains on the Brazilian line, many miles away.

Plodding on over the plateau, we dived into a clump of bushes that bordered it and a moment later came out upon the brink of a precipice which fell perpendicularly below us 800 feet. Opposite rose majestically the other side of the gorge. To the right, perhaps 500 yards away, I saw the fall!

It is impossible to describe the emotion of awe which came over me as I stood there with my single Indian guide gazing upon that obscure and isolated wonder of the world. It was some time before the definite impression of details began to strike me.

Grant was talking in his peculiar "baby" English. "The Fall of the Old Man," he said, "in our talk, '*Kaietuk*.' Long ago an old man of the village above here had so many 'jiggers' in his feet he was no more use. So they tied him in a canoe and let him go. He turned to stone, and his boat, too. You see him?" It was true that in the turbulent mass at the foot of the fall two of the boulders stood out clearly in the shape of an old man and his canoe.

There was no way to judge of the comparative size of the fall from where I stood. I remembered that in Saint Peter's, in Rome, I had judged from one end of the long nave that an angel at the other was on a level with my eyes; yet when I reached the angel I found it far above me. The same illusion distorted Kaieteur. I tried to recall some structure 750 feet high. It occurred to me that the Metropolitan Life tower in New York was not so tall! The comparison was striking.

I was greatly impressed by the softness of the monstrous fall. A smooth but rapid river nearly 400 feet wide flows quietly to the brink and turns quietly downward. In its fall it breaks into soft white mist and reaches the bottom in a chaos of seething clouds.

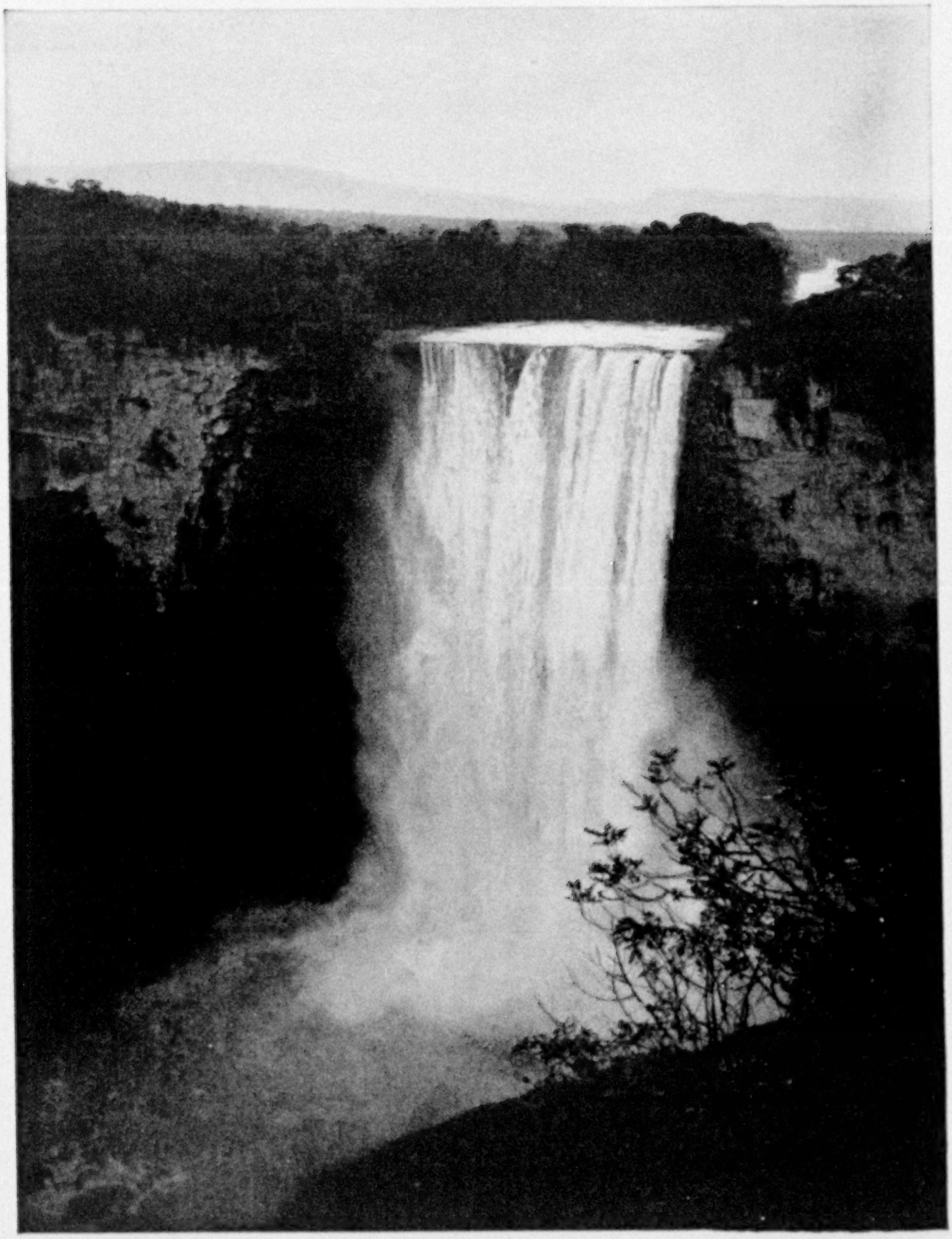


Photo by Leonard Kennedy

KAIETEUR FALLS, IN BRITISH GUIANA: THE DROP IS 741 FEET, OR ABOUT FIVE TIMES AS HIGH AS NIAGARA

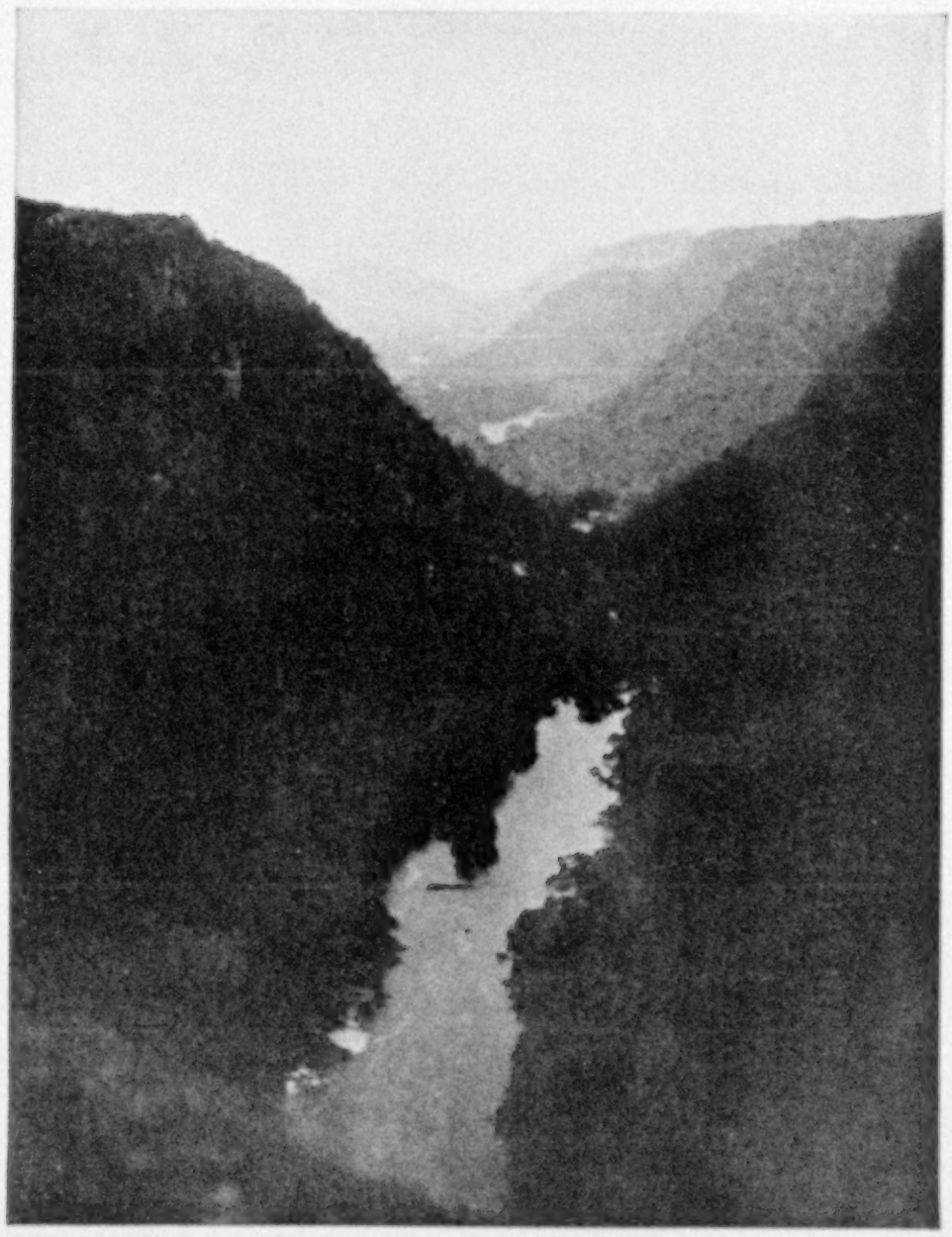


Photo by Leonard Kennedy

LOOKING DOWN KAIETEUR GORGE FROM THE BRINK OF THE FALL

There is a gentle roar. Only now and then a deep, thunderous growl arose from the hidden caverns at the bottom, giving some idea of the forces which contended there.

Above I could follow the path of the Potaro between the trees for a mile or so, and further off the country became rolling; in the distance, mountainous. The precipitous banks of the river curved in a semicircle, with the fall at the head. Directly below me the river rushed among huge boulders, as if terrified by the shock it had just received. The gray sandstone of which the gorge is formed was covered in many places by a thick growth of brilliant green moss, watered by the spray which constantly rises in clouds from the bottom of Kaieteur. The radiant color of that moss was almost the only touch of brilliancy I ever saw in the Guiana bush. Looking back through the valley up which I had come, another glorious view was opened. The higher plain was perfectly level as far as the eye could see. Through it the great gorge was cut, its twisting sides in equal slopes covered with tropical forests. The sky was of a dazzling blue, covered in part by fleecy gray clouds. Nature had formed a conspiracy to astound the eye of man.

From our vantage point we made our way along the edge of the canyon till we stood at the brink of the fall itself. Here we rested and enjoyed the cooler water of the river, for my thirst had not yet deserted me. In exploring the region and looking from different viewpoints at Kaieteur, we spent most of the day. We slept at Tukeit once more. And so our trip down the river began.

The return was almost uneventful. Two of my Indians contracted the fever and I left them at Kangarooma, where the others returned to them after bringing me to Potaro Landing. I hope they recovered; but, naturally, I never heard of them again. Traveling with the current, I made much better time than on my trip inland. Passing all the familiar points, I reached Georgetown on Saturday.

Today, seated in my study and surrounded by things of comfort, it is a boundless pleasure in which I often indulge to dream of Kaieteur. In the day, when my thoughts are elsewhere, and in the night, when I am sleeping, its flowing waters never cease to fall. And when my mind, wearied of the shrieking city, seeks the fastness of the Guiana jungle, Kaieteur is still tumbling there, undisturbed by man.

NOTES FROM A NATURALIST'S EXPERIENCES IN BRITISH GUIANA

By C. H. Eigenmann*

IT IS natural that British Guiana should have been settled by the Dutch, for "the coast lands are flat and for the most part swampy, being slightly depressed below the level of ordinary spring tides, so that sea-walls and other defenses have to be constructed to protect the settled parts of the coast lands from being flooded at high tides." The low land extends for 10 to 40 miles into the interior, and most of the cultivated area lies in this belt.

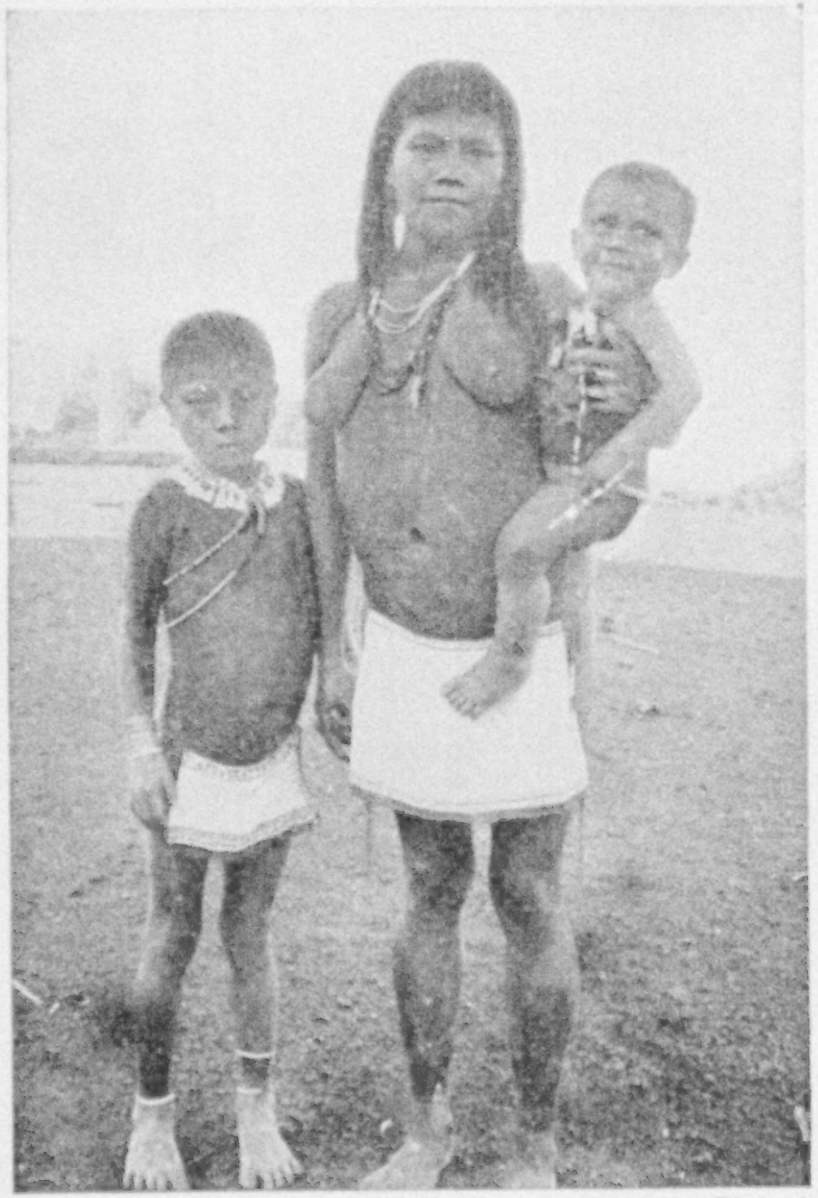
Beyond the low land comes a belt of undulating country, in part at least made up of old sand dunes and covered for the most part by forests. South of the sand dunes comes the hinterland, forming eleven-twelfths of the area of the colony and sloping up to 900 feet above sea-level at the source of the Takutu, on the western boundary, and about 400 feet at the source of the Courantyne, on the eastern boundary, and containing several mountain ranges.

"One of the most prominent features of the country is the great central mass of mostly flat-topped mountains, known as the Pakaraima group or chain, which occupies the most western portion of the colony, and stretches southward from the Cuyuni River to within 30 miles above the mouth of the Ireng River, and eastward to the Essequibo River, right across the colony as far as the Courantyne River." This area culminates in Mount Roraima, 12 square miles in area and rising 8,635 feet above the sea, the last 2,000 feet of which rise as perpendicular cliffs of sandstone from the surrounding country.

The rivers of the plateau leave it over high falls, of which the Kaieteur of the Potaro is the most famous. Rivers there are in abundance in the entire colony. Most of them are crossed by dikes, dividing them into stretches that are navigable, and others full of rapids and falls. The principal rivers are the Demerara and the Essequibo, to the latter of which the Cuyuni, Mazaruni, Potaro, and Rupununi are the principal tributaries.

I had two main objects in going to

* Abstracted from "The Fresh Water Fishes of British Guiana," by C. H. Eigenmann. Vol. V, of Memoirs of the Carnegie Museum, Pittsburgh.



NATIVE COSTUMES AT HOLMIA: THE FAMILY OF ONE OF THE CREW COME TO CALL

AN EAST INDIAN COOLIE WHO WORKS ON ONE OF THE SUGAR-CANE PLANTATIONS

Photos by C. H. Eigenmann

Part of our Indians were jolly, naked savages from near Holmia; the others were surly fellows, dressed in shirt and trousers, and had come from Brazil

British Guiana. I wanted to secure as many representatives of Characins, the dominant family of fresh-water fishes, as possible, and to compare the fish fauna of the plateau with that of the lowland. The former became an incident in the study of the latter question.

From August to December is the long dry season in Guiana. In consequence the upper portions of the rivers are lowest in October and November, and the fishes concentrate in the channels of the streams. We had rain during the first week of our stay in Guiana, but later were interrupted by rain or high water but once. While on the Guiana plateau at Holmia the rain of a day and a night raised the river many feet.

I sailed from New York on August 23, arriving in Georgetown on Sunday, September 6. Every calory of energy was consumed with the one object of making the trip a successful one. Whether we were successful or not may be judged by the fact that whereas but 116 species had been known to occur in British Guiana, there are now known to be 360. Of those added, 28 genera and 127 species were new.

The steamer left Georgetown at 8 a. m. and reached Wismar at 4:30. The water is muddy to about Berlin and becomes blackish farther up. Wismar is about 65 miles above Georgetown in a straight line. The Demerara is navigable to ocean-going sailing vessels to this point and is affected by the tide to the first cataract, about 100 miles from Georgetown in a straight line. The entire region from Georgetown to Wismar is flat except for occasional sand hills—old mud dunes. Creeks enter the Demerara from both sides about Wismar. These creeks are also affected by the tide, which gives rise to a peculiar mode of fishing.

Most of the mouths of the creeks are provided with partial fences built of poles and palm or banana leaves. The center is ordinarily left open for the flow of the tide. A mat can be placed in the gap

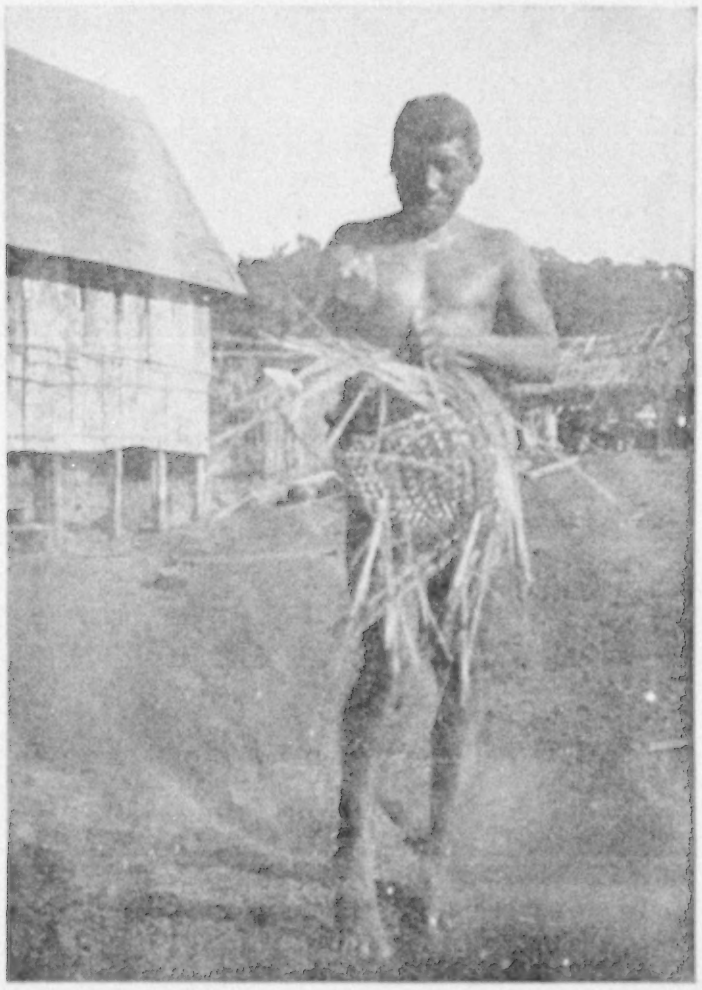


Photo by C. H. Eigenmann

ONE OF THE CREW WEAVING A BASKET TO SERVE AS A BIRD-CAGE, AT HOLMIA

The lower lip is pierced. Pins are carried thrust through the lip

which will prevent fishes from coming out of the creek (see picture, page 863). When the tide is high at night and fishes have left the main stream for the creek, the mat is put in place. In the morning, when the tide is out, the fishes trapped are either killed with a cutlass or poisoned. Many of our specimens were obtained in this way. The creeks are so full of brush that all ordinary methods of fishing are out of the question.

Except in a very few favorable places, the banks and shallows of the Demerara are so profusely grown with *Caladium arborescens* that the seine could not be used. I engaged fishermen to collect for me some distance below Wismar and had a creek poisoned at Kumaka. From all of these places I secured 90 species, six of which were not taken elsewhere.

From Wismar we took the train for

Rockstone, on the Essequibo River. Rockstone consists of a hotel, the railroad, steamer terminal station, a small store, and a number of workmen's cottages. All goods for the gold mines of the interior and all rubber coming from the interior are transferred here to avoid the cataracts in the Essequibo below Rockstone. All fever patients coming from the interior and all travelers going into the interior must remain here over night. The Essequibo is here divided into two channels by Gluck Island. At the time of our visit rocks were exposed at the Stelling and a short distance below Rockstone. At the bend of the river above Rockstone there was an extensive sandbar exposed.

I engaged two Indians, who were on a rubber boat waiting for a crew, to go up the Rupununi. We worked faithfully along the Stelling and below, with the poorest success I ever had anywhere. We could see fishes galore. One especially (*Chalceus macrolepidotus*), lustrous plumbeous with the most gorgeous, maroon-colored fins, flaunted its colors in my face, but it was impossible to get at it. At 10 we came to the hotel, I completely worn out, for this was the place where we were told we should catch fishes.

As we were waiting for breakfast a band of Indians came along, a man and about six girls and women. After parleying, it turned out that they were going to poison a creek. We asked them to wait at the station till we could join them and rushed through breakfast.

After skirting Gluck Island some time they stopped at a creek so small that I thought it could have no fishes (see picture, page 865). Two of the Indian women scraped a small depression into the ground, cut two sticks and used them as pestles and the depression as a mortar, in which they pounded a basketful of leaves to a pulp. They then built a fence across the creek with palm leaves, scraped the mud from their mortar into balls, and squeezed and washed them in the water some distance up the creek. The Indians and I were soon knee deep in water and mud, picking up the fishes that at once came to the surface. The little ones died in numbers on the banks; the bigger ones revived.

I ate dinner with a somewhat better feeling, but determined to use our big 150-foot net on the sandbank after dinner. The porters were all gone when we got to the station, but I picked up two negroes, took one of our Indians, and Mr. Kingsland, the agent at Wismar, went along. The crew played the most interesting tunes with their paddles. Whenever they became tired the leader would get all of them to hit the boat with their paddles at one or another part of the stroke with surprising results.

We landed on a place that looked as though it had been made for us. It was a shallow bay on the upper end of the sandbank, 150 feet across and with sand bottom. We stretched the big net across and hauled out at the head of the bay. Fish were flopping in every direction; dozens jumped over the net. At the critical moment enthusiasm got the better of even our Indian, who ran ashore with the top of the net and let out half the catch.

The next day till evening was devoted to sorting and preserving fishes. *Prochilodus*, a sucker-like Characin, gave us much trouble. Full-strength alcohol and formalin injected did not keep these from beginning to decay. In the evening we seined on the rocks of the Stelling and in the railroad mentioned above. At the Stelling we caught so many *Hemidoras carinatus*, a catfish with a row of spines along the side, and allies, all of whom erect their spines when caught, that it took us a long time to untangle them from the net. The pectoral spine is provided with retrorse hooks, and every spine must be individually disentangled from the net.

On the second of October we went to the Rockstone sandbar with our two Indians. We were soon joined by seven porters from Rockstone, who helped us pull the large net at the lower end of the sandbar. The chief things we secured were examples of *Geophagus* carrying young in their mouths. The

Photo by C. H. Eigenmann

A TRAP FENCE ACROSS A CREEK EMPTYING INTO THE DEMERARA RIVER ABOVE WISMAR, AT LOW TIDE (SEE TEXT, PAGE 861)

outer edge of the bar was almost barren, but yielded a few specimens of a minute, translucent Characidium that so resembles our sand-burrowing darters that we were amply paid for our heavy work.

But the greatest success was obtained in a slough between the upper half of the bar and the land, where the Indians took half a bushel of small fishes. There was a great general similarity between the contents of the net here and one drawn at any similar locality in the Mississippi Valley, although not a single Mississippi Valley species or genus was found in the catches. Here we secured the only specimen, a much mutilated one, of the widely distributed *Symbranchus*, and the young of many species of large fishes. Before starting for the sand-bank I had an opportunity of securing a laulau, a large catfish, but in the hurry of getting off and on account of a momentary penuriousness, I took only the head.

On counting noses, which has taken two full years since my return, I find that Rockstone, where our fishing began so discouragingly, is the richest in species of all the localities examined. This was no doubt due to the fact that conditions

for collecting were favorable. The water was low and we fished exhaustively in a variety of places. No doubt many channel fishes living here we did not get. Altogether we got 127 species, 78 of which were Characins. Of the 127 species, 14 were not taken elsewhere.

Tumatumari, whither we now proceeded, owes its existence to a cataract in the Potaro River. The goods brought up by the launch to the lower landing are transported by cart to the upper landing, and this transport gives employment for nearly all of the inhabitants. At the time of our visit the stream was confined to the northern channel, the southern channel being entirely dry. We made headquarters in the Sproston's rest-house, from where we had a look across the cataract. We collected on sandbars above and below the cataract, in the cataract itself, and in a little stream emptying from the south just below the cataract. Our experience in fishing may be quoted from letters home.

"We fished upstream until we came to a deep pool. The nondescript helping us did not know how to fish, and stepped on a spiny palm branch, besides; so I got in and told him to take a big club and beat the water to drive the fishes down. He did this slowly. Shideler and I then took up the net, for the banks were so steep and full of snags there was no place to haul it ashore.

"We were walking downstream, with the bag of the net in the water, to a place where we could land, when Shideler said: 'I believe we have an electric eel, for I have had two slight shocks.' I envied him, but too soon, for just then I got a good shock from my ankle to my knee. I jumped and yelled, not so much from pain as from the unexpected shock.

"We found we had five eels in the net, the largest three feet long, and it took manœuvering to get them into the buckets."

The "numb fish" early excited the interest of naturalists, and thus directed attention to the fish fauna of the Guianas. The first notice of the fishes of the Essequibo was an account of the doings of the electric eel, and in the second paper Bancroft attributed the shocks delivered by the electric eel to electricity. Humboldt described how his assistants drove some horses into the water to exhaust the eels; whereupon it became generally accepted that this was the usual method of fishing, although it is doubtful whether this method was ever tried more than the one time, when Humboldt saw it.

On the sandbank across from the lower landing we caught two more electric eels in a net well filled with fishes. It was surprising how soon everything was quiet in the flopping netful of fishes with such customers. I opened one of the eels and found small fishes in its stomach. I put a twig through the gill of the largest eel, for we proposed to eat it. I had the eel in one hand, and, in order to pick up the net, I put the lantern in the same hand; but as soon as the lantern touched the eel I got a shock through the handle. It was not a heavy shock, but I did not know how much heavier it might become, and so gave up that way of managing.

When I came to pick up the net containing the other eel I got another slight shock and concluded I needed help. We ate part of the largest eel. The electric organ was pasty, and the rest was so full of bones that we did not succeed with it.

At Amatuk I enjoyed especially the lazily flopping butterflies crossing the river, and the flying fishes (*Gasteropelicus*). The latter would dart up in front of us, cut through the water, leaving the breast or tail in, and beating the water with their pectorals. They would cut through the water for 40 or more feet and then leave it entirely for five or ten feet. At the end of their flight they would fall sidewise into the water. At first it looked to be a long, slender fish, but by watching near the end of the flight, when the momentum was gone, the shape could readily be made out. To make sure, I asked the Indians to point out the fish when we seined. William pointed at a long, slender Creatochanes; but the naked hunter shook his head and

Photo by C. H. Eigenmann

PREPARING TO POISON A CREEK

A small bar of palm leaves has been built across the mouth of the creek (see page 862)

with thumb and forefinger made a circle, which left no doubt that he knew the fish. We caught none in the Potaro, where we saw them in great numbers, but we got them in abundance in the lower Demerara. *Carnegiella*, the gem of the entire collection, a near relative of *Gasteropelicus*, is less apt in its flight. Whole schools will leave the water and skeeter along the surface.

After breakfast we rowed up through the 1,000-foot-deep gorge the Potaro has cut through the table-land. The edges of the gorge are carved in a variety of ways that give them the appearance of high mountains. The valley is quite broad, which would indicate great age for the gorge.

The Indians shot a baboon on the way up to the next portage at Waratuk. We camped rather early in the day, above Waratuk, and during the night I had a particularly severe case of chills and fever.

At 8 o'clock on the morning of October 17 we had our first glimpse of the pride of Guiana, the Kaieteur, hidden in mist. We camped shortly afterwards at Tukeit, called by the Indians Tukui, or humming-bird, after the waterfall coming from the plateau opposite. Our hunters killed four peccaries across the river, and the young wild pork was a pleasant change from the canned meat. At Tukeit there is another cataract in the Potaro, and above it several more towards the foot of the fall.

We collected in the Potaro at Tukeit and the following morning started to ascend the plateau. The path leads back from the river for a time, crosses Shrimp Creek, and then ascends very steeply to

the tip of the plateau, where the path is comparatively level again, through the woods, to the edge of the savanna, or treeless tract, immediately about the fall.

After breakfast at the edge of the savanna, Mr. Shideler and myself, William, and another Indian walked over to the edge of the precipice and to the fall, while the rest of the Indians went on to pitch camp and get the boats ready. The scenery about the fall is unique. Looking down the stream, one sees the U-shaped gorge cut by the Potaro in the level plateau. The Potaro is visible from time to time as it crosses from one side of the valley to the other. Only different sections of the upper part of the fall can be seen from the edge of the gorge.

The best view of the fall can be had by climbing down on a ledge of rock at the edge of the precipice. I not only climbed down, but, all excitement with the fever, the steep climb, and the superb view, set up my camera on the ledge and took numerous photographs. I confess to feeling distinctly dizzy when I placed my head under the focusing cloth, knowing that if something should happen I and the camera would land on the rocks a thousand feet below. Not that I could find a finer place to die, but I hesitated to start to kingdom come on such a heavy down grade!

Kaieteur Fall is caused by an excessively hard conglomerate, which overlies a softer sandstone. The savanna above the fall is in large part this naked conglomerate. In places bushes grow from cracks, or bunches of grass, or flowers cling to little accumulations of soil that can be kicked from place to place.

Holmia, which formed our next fishing base, is the trading camp of the Essequibo Exploration Company. It is situated on the Potaro, at the entrance of the Chenepowo River, and contains a store and depot surrounded by a few Indian huts. My crew of Indians went out at once to collect poison, the root of a plant called "hiari," under the guidance of a local Indian, Jordan. The Indians of the surrounding regions also brought me fishes, and I poisoned a small creek just behind the houses. Unfortunately, it rained heavily, so that the Chenepowo and the Potaro rose many feet and made fishing in these rivers not profitable for some time. We went up the Potaro a distance further and poisoned two creeks just below the Aruataima Cataract. In the cataract iself we could do nothing on account of the high water. William later collected in the cataract and sent me two new genera and three new species, from which it would seem that further collecting at this point would prove profitable.

It seemed that each creek on the plateau we examined contained some one dominant form and a few stragglers, the dominant forms varying in the different creeks.

On our return to Kaieteur we first tried poisoning a little branch above the fall at Waratuk and got some specimens. Then we tried a more ambitious scheme of poisoning a big branch below the fall, as I had found that the poison will drive some fishes out before it kills them. We had three men pound hiari and wash it into the branch of the northern part of the fall. William and another Indian stood a long distance below, after the water had flowed in among and under the rocks. I at first stayed by a pool near where they were poisoning. Soon a depressed little fish came fluttering to the surface. It clings to the rock and looks like one. They were new and I dipped with enthusiasm till I fell in. This broke the ice for me, for I then waded from rock to rock, securing over 70 specimens of the new genus *Lithoxus*. William came with a dip-net full of long, curve-mouthed Gymnotiduls I had not seen.

We poisoned and waded, gathering in all half a bucketful of small fishes, all valuable as specimens. It was rare sport, and I did not realize that it was 10 o'clock and I was played out. We had soup, rice, tea, and jam for breakfast, and started at 11:30 on the home stretch.

Most of the Indians had done nothing but swing in the hammock all the morning, so they paddled with a swish and

Photo by C. H. Eigenmann

SEINING ON THE SANDBAR BELOW THE AMATUK CATARACTS

swing, in great contrast to yesterday's dilly-dallying. At 1 p. m. we were at Erukin, a sandy, clear creek that I wanted poisoned. We had fished here at night with poor success on the way up. William thought it was too big and swift to poison, but I had them stretch the net across the mouth, sent the pounders upstream, and William, some other Indians, and myself took up stations at intervals. I stood in the creek in a patch of sunlight, where every grain of sand could be seen on the bottom. Soon fishes came down the stream in distress, and when the poison was exhausted we found we had a number of novelties in our dip-nets, and the 15-foot net at the mouth of the creek had caught nearly all as they came down.

At 2:30 we were moving again, and when, near 4 o'clock, William cried out "Kangaruma" all paddles stopped for a moment, and then dashed on to land us a few minutes later at the town.

For about a month I had not slept out of hearing of the roar of cataracts. Tumatumari, Kangaruma, Amatuk, Waratuk, Tucui, Kaieteur, and Holmia are all on cataracts or falls. In fact they are all places where goods have to be transported on account of them. I had so much "stuff" that it took more than one trip for the 12 carrying-Indians that had come down with me.

The Potaro Gorge is one of the remarkable features of the world. The river is lined with trees so tall they could only thrive in a region free from strong winds. The sides of the gorge are rugged, and the whole recalls the Rhine or the Yosemite. We saw no one from the time of striking into the woods behind Potaro Landing till we reached Holmia. The entire stretch is utterly uninhabited,

Photo by C. H. Eigenmann

SEINING IN THE OCEAN AT ST. CROIX: BRITISH GUIANA

and very few tourists pass this way to get the inspiring view of fall and gorge from its upper brink. The region between Savannah Landing and Helmia is level, but mountains can be seen in the distance toward the south when the view is not obstructed by trees.

Measurements made by Brown show that the Potaro River 600 feet above the fall is 402 feet wide and 20 and two-tenths feet deep. At the brink of the fall it is 369 feet wide. These measurements are taken at flood. The fall is 741 feet high, and in the 1,020 feet from the kettle below the fall the Potaro has a fall of 81 feet. The brink of the fall is about 1,130 feet above sea-level.

From Tumatumari I boarded the launch, taking with me a negro, Mr. Cummings, with a bateau. We landed at the head of an island a short distance below the mouth of the Potaro and just above Crab Falls, where there was an Indian settlement. We slung our hammocks under the shelter of one of their huts. My own hammock, that of Mr. Cummings, and that of an Indian woman radiated from the same center pole, at the base of which a monkey was tied! Cummings and the Indians went out with the net at night to fish on the sandbanks. I remained in my hammock to recuperate from the fever. On the fifth I sent several of the Indians out to dig hiari roots, while I fished about the rocks of Crab Falls. The Essequibo is very wide at this point, divided by an island, and falls over a dike running square across the river just after it has made a turn.

On the sixth Cummings, myself, and four Indians went with the bateau up the Essequibo to shoot Pacu, the most famous food fish of the colony, at the Warraputa Cataract. Above the Potaro mouth the Essequibo is broken up by a large number of rocky islets, the fragments of a dike crossing the river. Other dikes cross the river further up, the water rushing through the gaps. Through some of the gaps the Indians succeeded in paddling the bateau; through others they dragged the boat, after being driven back several times by the current.

A dike extends across the Essequibo at the mouth of the Konawaruk. Opposite the Konawaruk and below the dike there was a lagoon separated from the river by a sandy and partly wooded spit of land, but connected below with the river. Near the head of the bayou and connected with it by a few inches of water there was a pool toward the river side. It was not more than 50 feet in diameter and perhaps 6 feet deep in its deepest part. Trees overhung it from the river side.

The Indians beat some hiari roots to shreds. They were tied into bundles and the two Indian boys swam through the pool with them. First one species of fish and then another came to the surface, and then they came indiscriminately. A stingaree came fluttering to the surface toward the last, while the little *Corydoras punctatus* withstood the poison to the end. *Catoprion mento*, a Mylinid Characin with a projecting chin, was particularly acceptable. The fish that created the greatest interest was *Mænkhausia dichrourus*, of which I had seen dozens of "specimens" all the way from Paraguay to Para, and all of them conveyed about as much idea of the appearance of the living fish as a dead and plucked Baltimore oriole would of the living bird. The base of the tail is bright canary yellow, the lobes are crossed with jet-black bands, and the tips are milky white. I do not know how long we stayed here; not over two hours, during which over 40 species were taken out of the pool.

We continued our row to the Warraputa Cataract. The river is divided here into several branches by wooded islands. The two older Indians started out to shoot Pacu, but bagged nothing. The rest of the crew and myself set to work to poison a branch of the cataract, where we were again quite successful, securing a series of specimens that recalled the Amatuk Cataract, and also a series of the young of the Pacu, the first that were obtained or recognized as such. After the poisoning Cummings went to the sandbank to prepare supper, while I with the two young Indians browsed about the dike which causes the cataract. On my return I found that no provision had been made for my hammock, and the Indians refused to go into the bush at night to secure palm branches. I did not like to risk a drenching rain so soon after getting rid of the fever. I insisted that the Indians either build me a shelter or take me back to their camp. Giving them an alternative was a mistake—they decided to take me back. It did not rain that night. It was all very well to come up through the gaps in the dikes in the daytime; it was quite another matter to safely guide the bateau down through them at night. We shot through at a tremendous rate, and once the boat touched something. The boys shouted with glee, while I came to a sober reali-

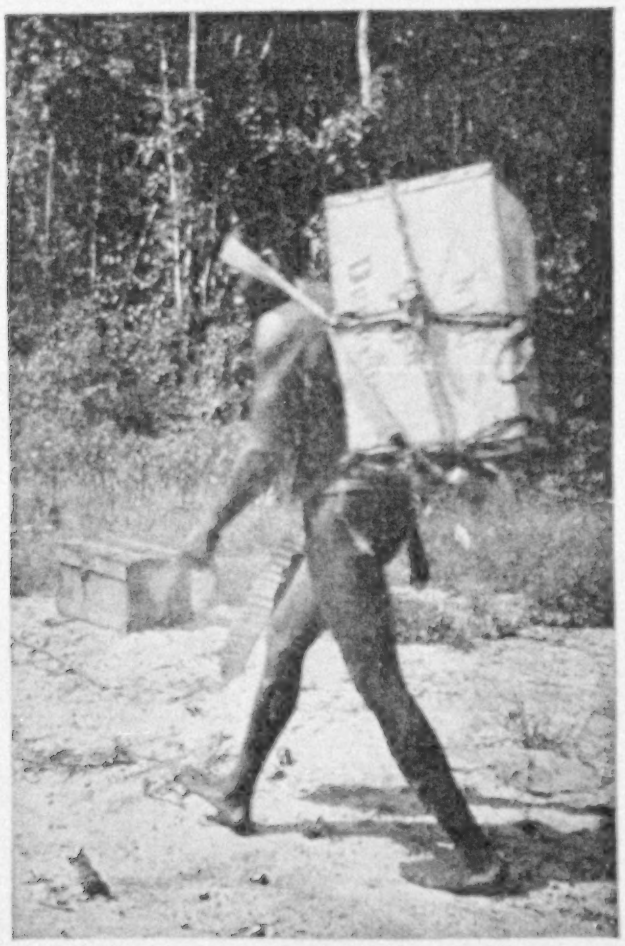


Photo by C. H. Eigenmann

TRANSPORTING OUR GOODS BY THE USUAL METHODS AT KANGARUMA

The load is limited to 60 pounds per man, and the package must not exceed certain dimensions.

zation that it would have been better to trust the sky than the rapids. But we came safely back to the huts early in the evening.

On the seventh of November I collected about the rocks just above Crab Falls. Here I succeeded again in getting fishes with hiari that could have been secured in no other way. At one point the bank is piled with huge blocks of stone. To dislodge the fishes from between them would have been impossible in any ordinary way. We pounded some hiari roots and washed them into the swift current that was flowing towards the rocks. At once some species came to the surface, straight up without attempt to escape. Several species were dislodged, including an electric eel. We repeatedly got it into our dipnet and it as often got out again, without, however, making any co-ordinated movement to escape from the reach of the net. It proved too slippery, however, and got away. When the boat came by from Tumatumari we loaded my effects into it and I left the region of the Potaro and upper Essequibo.

PECULIAR CAVES OF ASIA MINOR

By Elizabeth H. Brewer

With Photos by the Author

FEW travelers have visited the Troglodyte dwellings of Asia Minor, not because they are lacking in interest, but because traveling in that country is not easy. There are two or three short railroads near the coast, and one from Constantinople to Konieh (the ancient Iconium), a road which will ultimately extend to Bagdad. But if you wish to see the interior of the country, it must be either on horseback or by carriage. There are several fair wagon roads, but often you must mount your horse, climb mountains, ford rivers, and wander through forests. Many times the path is discernible only a few steps in advance. Another inconvenience of travel is the necessity of taking all things needful for man and beast—such things as bed and bedding, cooking utensils, and food.

A few summers ago I was in Everek, a large town at the foot of Mt. Argæus and about 150 miles from the Mediterranean Sea, near Tarsus. To the south of Argæus is a wide plain, opening from which toward the west run several narrow valleys. Two of these, Soghanli Dere (valley) and Urgub Dere, have many traces of the early or earliest inhabitants. I had planned to visit the former valley, but my foreign escort failed; and, the region not being very safe, I decided to go to the better-known valley of Urgub.

It was something of an undertaking to go on a four days' trip away from regular lines of travel with only a young Armenian teacher and his father; but as there were no other obstacles in the way, I went. Although it was past the middle of September, the sun at noonday was very hot. Therefore we started soon after 5 a. m., and rode through the narrow, stony streets of Everek, then around the base of Mt. Argæus (Erjias Dagh). The grand old mountain towered high into the air, the highest point in Asia Minor (13,100 feet). The summer sun had melted all the snow on its southern side, so only bare rocks remained. The ascent did not look very steep, yet I was told by one familiar with Alpine climbing that this is more difficult than that.

Our little caravan had somewhat increased, and consisted of my young guide and his father, large men mounted on little donkeys; another Armenian and his son, and a Turk, these three taking

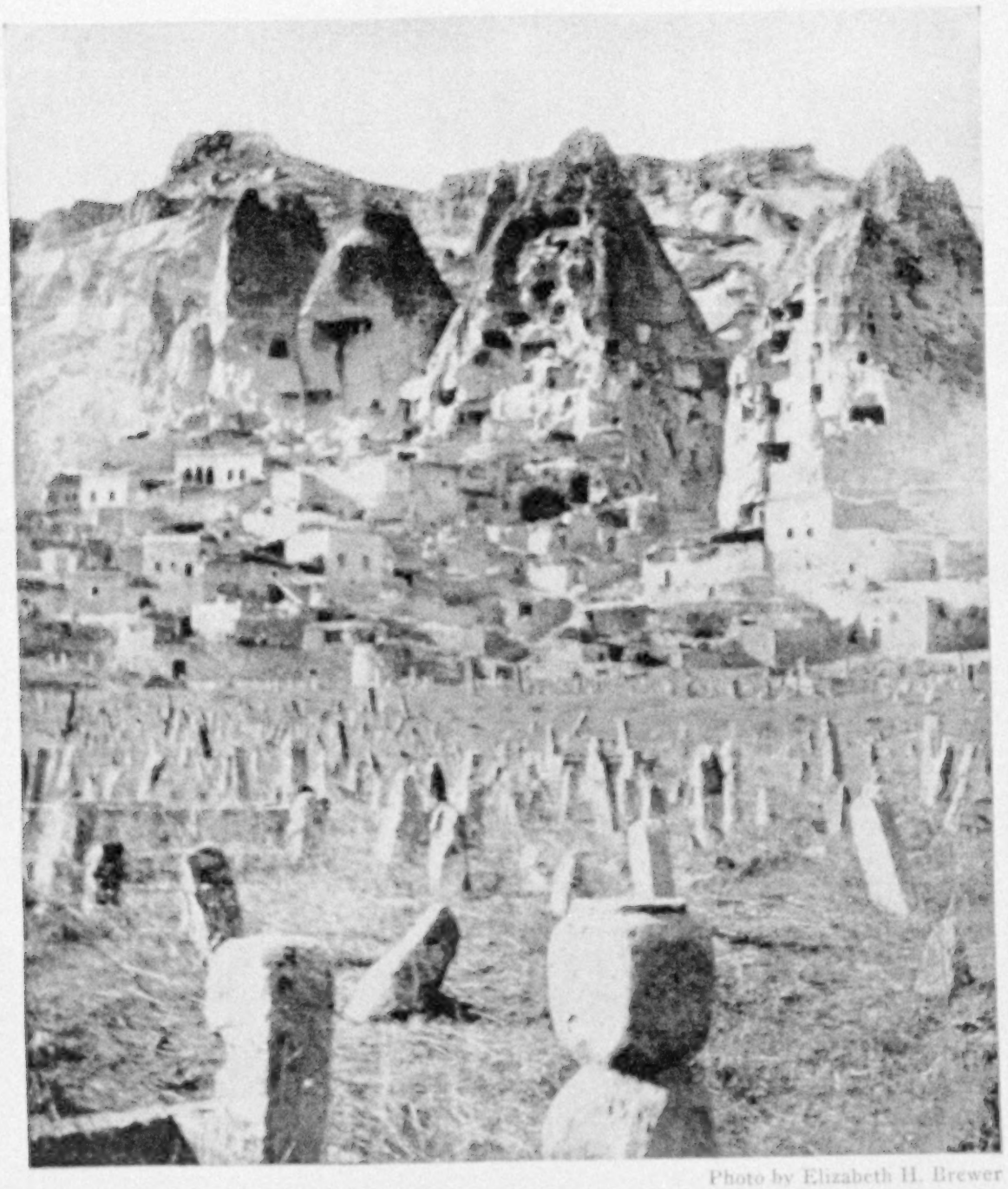


Photo by Elizabeth H. Brewer

CONE FOREST NEAR GARIN: TURKISH CEMETERY

advantage of our trip to go to Urgub; the muleteer, and a donkey with my load. There is always danger of robbers, and people do not like to travel alone. Hence news of any one making a journey is soon spread and others join the party.

Trees are rare on these plains and one gladly welcomes them; so when after five hours we came to a tree, we rested under its shade for lunch. Near us were rude tents, the homes of shepherds who watched their flocks.

We, or rather I, was a great curiosity. Foreigners, or even natives in European dress, are uncommon, and a woman who rode a side saddle was strange, indeed. The people asked, "Does she have only one leg?" As we sat on the stones eating, men, women, and children crowded around to watch the process in every little detail.

The ride across the plain was long. There is almost no vegetation, the soil is very salty, and reflected the hot sun. In the distance the effect was like a large lake; the mirage was so perfect that only as we approached could we realize that these were barren sands. I have never

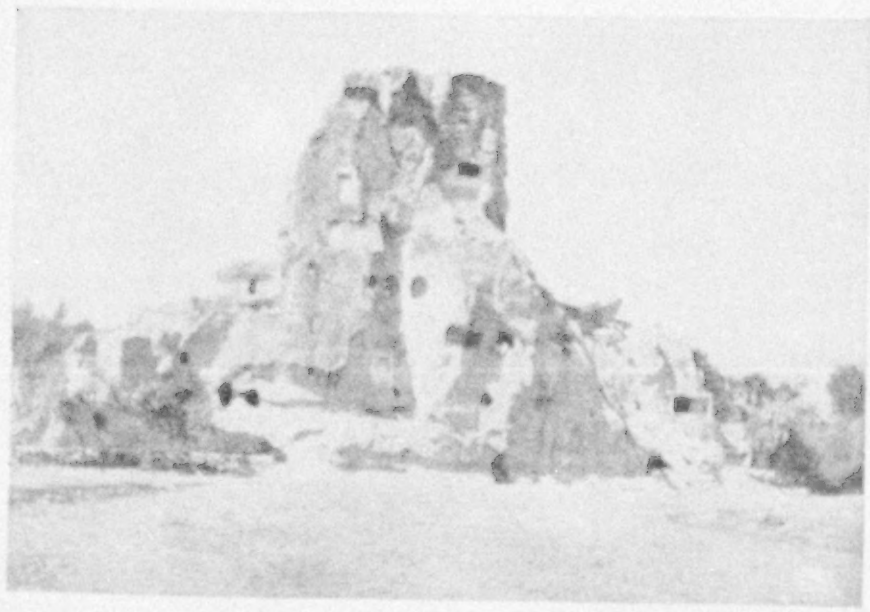


Photo by Elizabeth H. Brewer

PIGEON CONE NEAR ÜRGÜB

seen the desert, yet I fancy this was not unlike it, only smaller in extent. Because the plain seems to lengthen as one goes, it is called by the Turkish word "Yuvash, yuvash" (slow, slow).

Late in the afternoon we left the plain and entered a narrow valley, up over stony, uneven paths to a high ridge, where below us, on the other side, was the little village which was to be our first stopping place. It was quite dark when we entered, so we attracted little attention. The father, who was well acquainted here, had said we should find comfortable rooms. Imagine my dismay when we were taken to a room, large enough, it is true, but dark and gloomy, with little air, and which would have to serve the three of us. I viewed the room from all points inside, and also from the outside; there was no chance for privacy and no other place near safe enough for me.

After our tea and calls from various people, we looked at other houses and found one with a wide porch having three arches. This opened on the road, but was too high for any one to get in or easily see in. The curtain which I always carried, and is, by the way, an essential in traveling, was hung from one pillar to the house and made me a little room at the further end, my companions having the rest of the porch. There was plenty of fresh air, the night was comfortable, and I was perfectly safe.

We were to make an early start, so I got up in the dark hours. One of the men made a fire and prepared coffee. After that, however, we went back to sleep, and it was at least two hours later before all were ready. These people live by the sun, and the muleteers could not be induced to start until daylight was fully upon us. The morning was beautiful. Our way wound along through the fertile Urgub Valley. It is narrow, with a stream flowing through it; the hillsides were covered with vineyards full of luxuriant fruit. Occasionally we bought a watermelon or two (small as muskmelons) for our refreshment. As we rode along in the sweet morning air all nature was charming.

Soon my attention was attracted by a strange rock formation. The rock seemed to be worn away in places, leaving a series of cones very white and glistening. These were on both sides of the valley. Sometimes they were entirely free from the rest of the rock and looked like a forest. They varied greatly in size, from 10 to 40 or 50 feet in height. Many had openings and seemed intended for dwellings. My curiosity was aroused, but we could not now tarry.

As we entered Urgub toward noon we passed a large irregular cone, 100 or 200 feet high, with many windows. It stood by itself and interested us at once. I took a photograph and later intended to explore it, but was told that now it is only a home for pigeons and cannot be visited.

The sun had grown very hot, the glare from the white houses was trying, and I appreciated the hospitality of friends. While I rested my companions went in search of a guide.

We were disappointed to find that this

Photo by Elizabeth H. Brewer

SHEPHERD AND DOGS

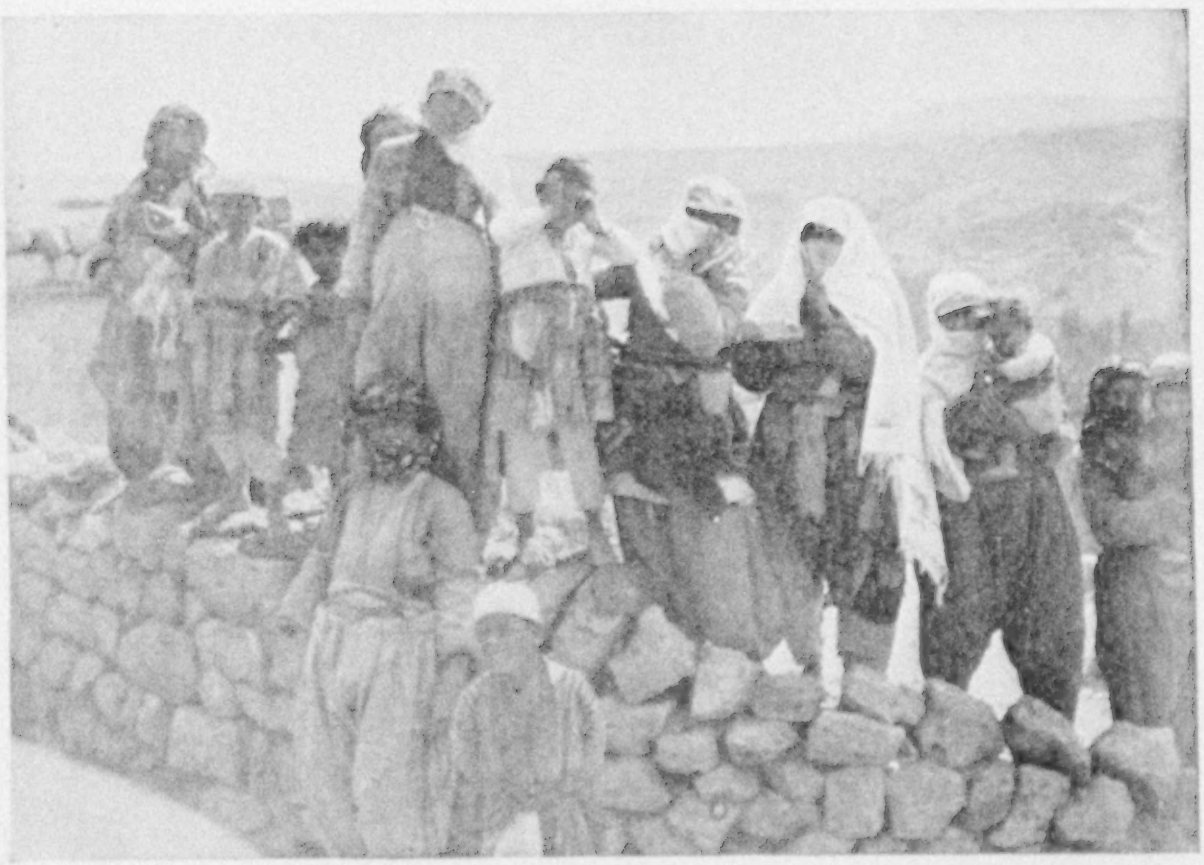


Photo by Elizabeth H. Brewer

WOMEN AT BOSCHKENT

"Don't scold us; don't drive us away. We only want to look"

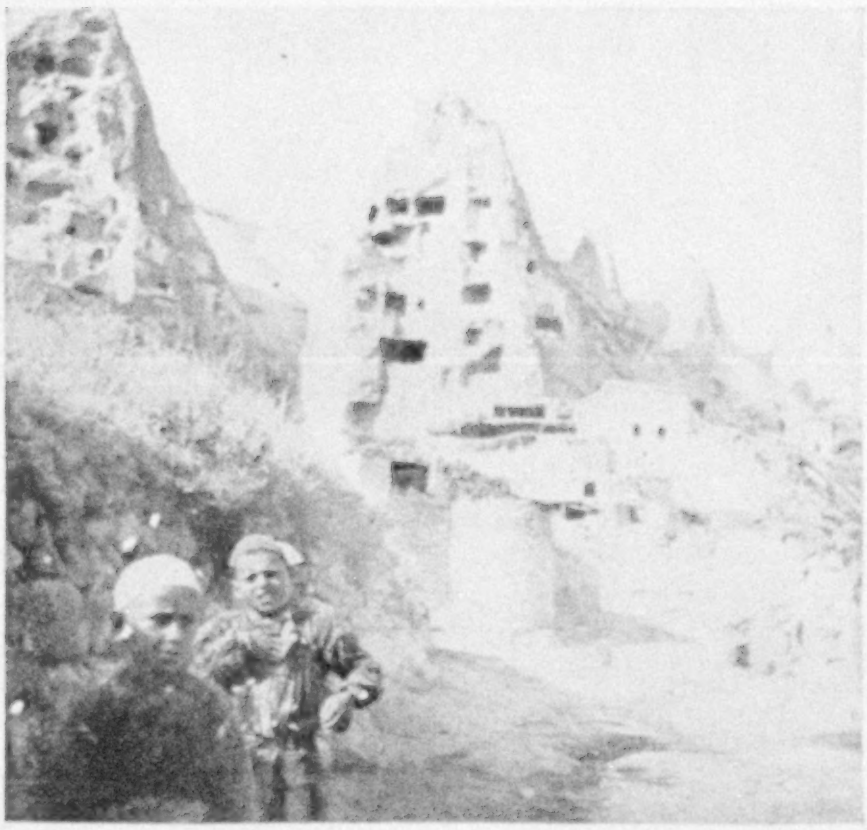


Photo by Elizabeth H. Brewer

LARGE PYRAMIDS IN GARIN

town with so many rock houses had little of real interest, and that we had come all this way for nothing. Urgub is built on a side hill and many houses are cut into the rock, but the places which looked most attractive belonged only to Moslems and we could not gain entrance.

Our first thought was to rest a few hours and then return to the place where we had seen the cones, but after talking with some of the Protestant Greeks we decided to hold a service that evening and leave early the next morning. Had there been one more day for our trip we should have driven to Martchan, a few miles away, and seen a rock church and other cones which towered in the distance.

We wandered about the town and called on one of the Greek Protestants. Word of the meeting was sent around, and some 30 or 40 gathered in that upper room eager to hear the words of life. Men with faces worn by care and toil, mothers with little ones in their arms, children attentively listening. My young companion translated, for we spoke different languages, but we had met to worship the same God and strengthen our mutual faith. Almost every one waited to shake hands and to thank heartily.

True to their promise, the muleteers were on hand, and before day had fairly come we were off. In many places on the hillsides I saw dark patches. After puzzling for some time, I asked what caused the peculiar soil. "Oh, those are masses of grapes spread out to dry," was the answer.

At last we came back to my cone forest. One or two hundred cones were clustered together. We entered several and found a similar plan in each. One large room about 10 feet high cut out in the rock. There were a window, a fireplace, and shelves cut in the sides. The stone was soft and the heat of fires had melted it sufficiently to form a glaze over the interior surface. Some of the cones were connected, so that we could go through the doors from one dwelling to another. In a few, windows were up quite high.

Weird indeed it was to be wandering through this desolate city, this city of the past. When and by whom were these houses made? I eagerly scanned the walls inside and out, but here there was nothing, not a word or a mark to betray the ancient inhabitants. Far back in history mention is made of people who lived in caves, as in Obadiah, "The pride of thy heart hath deceived thee, thou that dwellest in the clefts of the rock, whose habitation is high," but we have no idea of these strange dwellers.

Professor Sterrett, of Cornell University, who visited this region and examined the cones fully, comes to the conclusion that "the cones of Cappadocia were well known and inhabited in the dim distant Hittite period, at about 1900 B. C., a date beyond which we cannot go and need not try to go."

This is a volcanic region and the layers of rock are of different degrees of hardness. During the centuries the softer material has worn away, leaving, as Professor Sterrett says, "tens of thousands of more or less isolated cones and cone pyramids. It is known that a chamber 25 feet long, 13 feet broad, and 10 feet high was excavated by a single workman in 30 days."

A half hour further brought us to the little village of Garin; the houses were mostly cones, two being especially large and fine looking. We counted 10 or 12 tiers of windows. I was extremely anxious to enter these dwellings, but this was a Moslem village, and we attracted so much attention that my companions were absolutely unwilling to have me tarry at all. We crossed the valley and passed one or two large isolated cones, of which I took photographs. They were evidently used for storehouses.

About noon we reached Boshkeni (head village), where we had passed the first night. It was daylight now and people came in crowds to see the strange sight. I sat on the porch, sheltered from too near approach, but on a little rise of ground in front the women and children gathered. I ate my lunch, arranged my hair, and washed my hands, to the great astonishment of the watchers. One of my companions came in at that moment and was about to speak to the women. "Don't scold us," they said; "don't drive us away; we only want to look." For once I felt like Barnum's greatest show, but I did not object to their looking and took the opportunity myself to snap as many of them as possible with my camera.

It was just at the season of wheat harvest, and many large threshing-floors were crowded together near the village. In one place the oxen were treading out the wheat; in another a man or a woman was tossing it into the air to let the wind carry away the chaff, and in still another place some were putting the good grain into bags. A high wind so completely covered us with chaff that we were obliged to wait until the shower had stopped.

From here we retraced our steps toward Everek; up the hill, then down, down again to the valley.

As we rested by the way two Circassians passed us. I had heard so many stories of Circassians that, although assured these men were friendly, I was glad when they were gone. It was almost dark when we encamped for the night in one of the many sheepfolds on the edge of the plain. Stones were piled at the entrance so that we could not easily be disturbed. My bed was spread near the wall, with my good horse, Charlemagne, not far away, and there under the light of the stars, with this strange company, the night passed. Before daybreak we were crossing the salt plain, and by noon, hot, tired, and sleepy, we gladly welcomed the shelter of friends at Everek.

THE SPEEDIEST BOAT

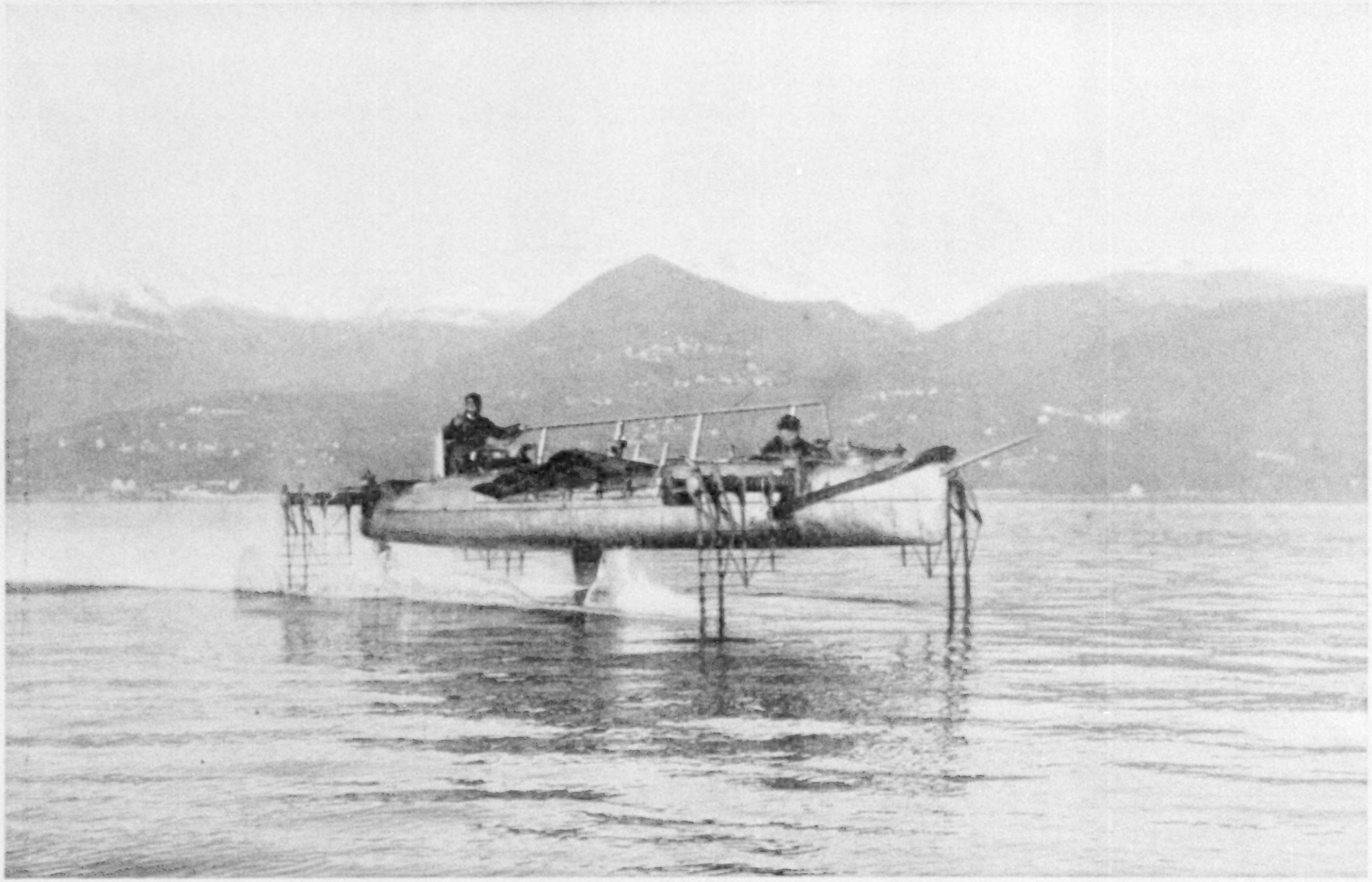
THROUGH the courtesy of Dr. Alexander Graham Bell and Mr. F. W. Baldwin, the NATIONAL GEOGRAPHIC MAGAZINE publishes illustrations on pages 876-877 of perhaps the most unusual craft afloat, the hydroplane boat of Mr. Forlanini. In this motorboat Dr. Bell recently traveled 45 miles an hour on Lake Maggiore, Italy.

The new Italian hydroplane is described by its inventor, Enrico Forlanini, of Milan, as follows:*

"The apparatus has been patented under the name of appareccio idrovolante (apparatus for hydroplaning). It constitutes true hydraulic flight, the apparatus being sustained by the water in the same manner that birds and aëroplanes are sustained in the air; that is to say, by the dynamic reaction of the water on the superfices or planes attached to the hull of the hydroplanes, most of these planes remaining completely out of the water while the machine is in action.

"The idea of using the dynamic reaction of the water is not new, but up to

* Quoted from the New York *Evening Post*.



THE HYDROPLANE BOAT OF SIGNOR FORLANINI TRAVELING ON LAKE MAGGIORE, ITALY, AT A SPEED OF 45 MILES AN HOUR

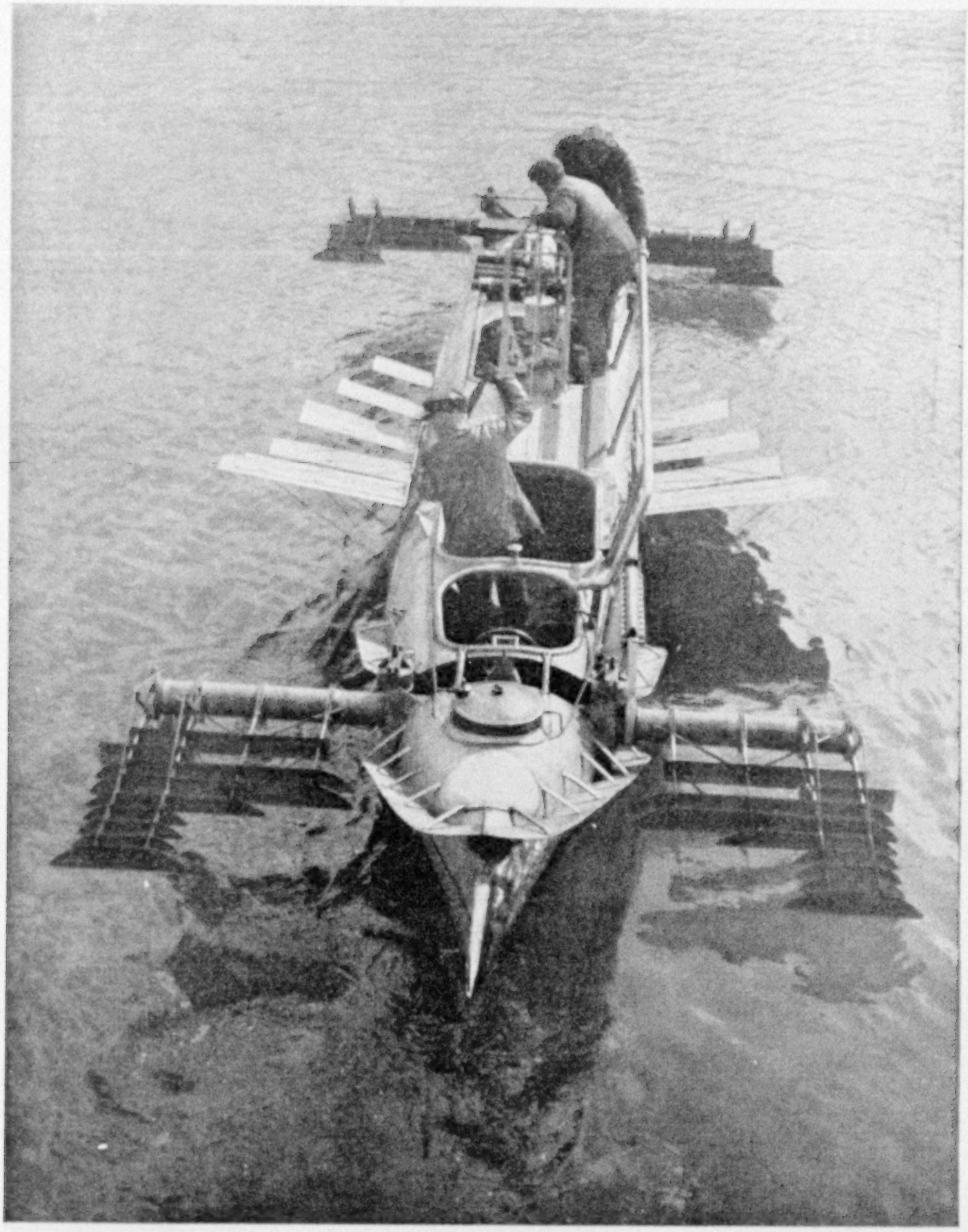


Photo by F. W. Baldwin

LOOKING DOWN ON THE HYDROPLANE BOAT OF SIGNOR FORLANINI

The hydroplane has just been taken out of the boathouse, and the hydro-surfaces have not yet been turned down into the water. The men in the hydroplane are Mr. Forlanini (amidships), and in the stern Dr. Soldati and a mechanic.

the present has not been applied with success except what has been attempted with gliding boats. In these boats, however, the hull does not leave the water, but skims on the surface, which hinders the attainment of really high speeds.

"The most important characteristic of the hydroplane is that the resistance of the water is not dependent on the speed, but remains constant, and is equal to half the total weight of the apparatus; the total resistance is increased only by a portion of resistance due to the air, a portion naturally proportional to the square of the speed. In consequence, similar hydroplanes in the future should be able to attain speeds of 60 to 100 miles an hour and change themselves into flying machines by the addition of the necessary planes for aërial suspension."

* * * * * *

After six years of experimenting, Forlanini can now consider that he has arrived at fully satisfactory and definite results, says the *Scientific American*. The first hydroplane he tried, during the years 1905 and 1907, immediately demonstrated the excellence of the new system, but its performances were always handicapped by the irregular working of a bad 70-horsepower motor with which it was fitted. Another hydroplane, tried during the years 1908 and 1909, was fitted with a steam motor that worked more regularly. Although the effective power was only 25 horsepower and the weight of the boat over a ton, this machine attained a speed of over 50 kilometers an hour.

The hydroplane that is being tested at present weighs two tons when there are two persons aboard—it is possible to carry four other persons—and it is fitted with a 100-horsepower gasolene motor. It has attained a speed of 45 miles an hour, and this speed will be increased by the introduction of a few modifications that are being gradually indicated during the trials it is now undergoing. This hydroplane has a hull 32.8 feet long; at the bows and stern are two strong steel tubes transversely. At the four free ends of these tubes—namely, on the starboard and port sides of the boat—is fixed a sort of framework, which contains a series of planes, one above the other. These superfices of planes are made of high-resistance steel, the workmanship being very accurate, and their size decreases from the top to the bottom.

When the hydroplane is not working, but is floating on the water like any other ordinary boat, the planes are immersed in the water, and have a slight horizontal inclination. As soon as the hydroplane, owing to the working of the screw, begins to move forward, the water exercises a vertical force on the planes in precisely the same manner as the air on the planes of an aëroplane. The hull therefore tends to rise and so diminish its immersion and, naturally, the resistance against its motion in a manner that the speed is able to increase.

In this way there comes a moment when the hull is completely out of the water. At this point the speed rapidly increases, and little by little the various planes or superfices rise out of the water one after the other. When the maximum speed is reached only the bottom planes remain on the water, while the bottom of the hull is 65 centimeters higher.

The propeller by which this strange craft is driven is carried on a hollow fin, which may be seen amidships, the short propeller shaft being revolved by bevel gears attached to a vertical intermediate shaft, driven direct off the motor.

IMPORTANT CORRECTION

ON page 603 of the July, 1911, issue the credit line under the illustration of the diplodocus was erroneously given as "the late" Charles R. Knight. Mr. Knight, the well-known artist-naturalist, whose paintings and models of birds, animals, and fossil creatures for the United States government, the Carnegie Institute, and the American Museum of Natural History have distinguished him in his profession, resides at Lawrence Park, Bronxville, N. Y.

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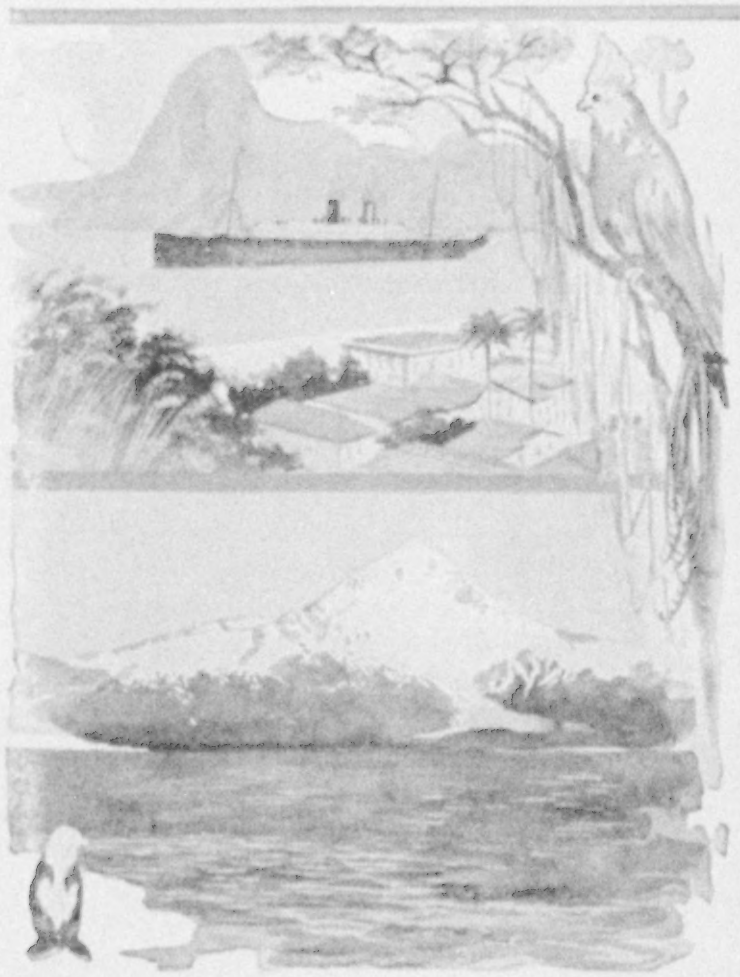

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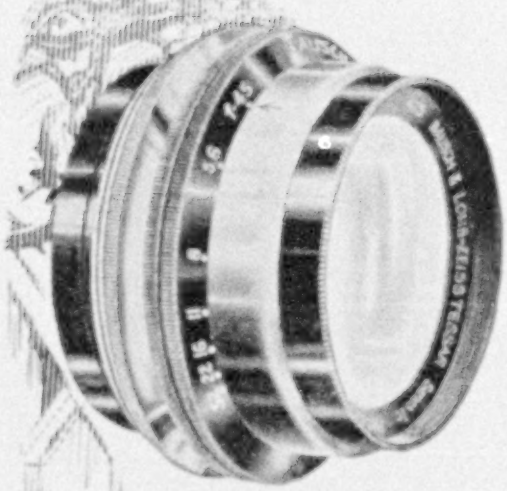

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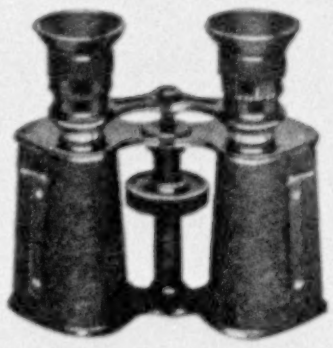

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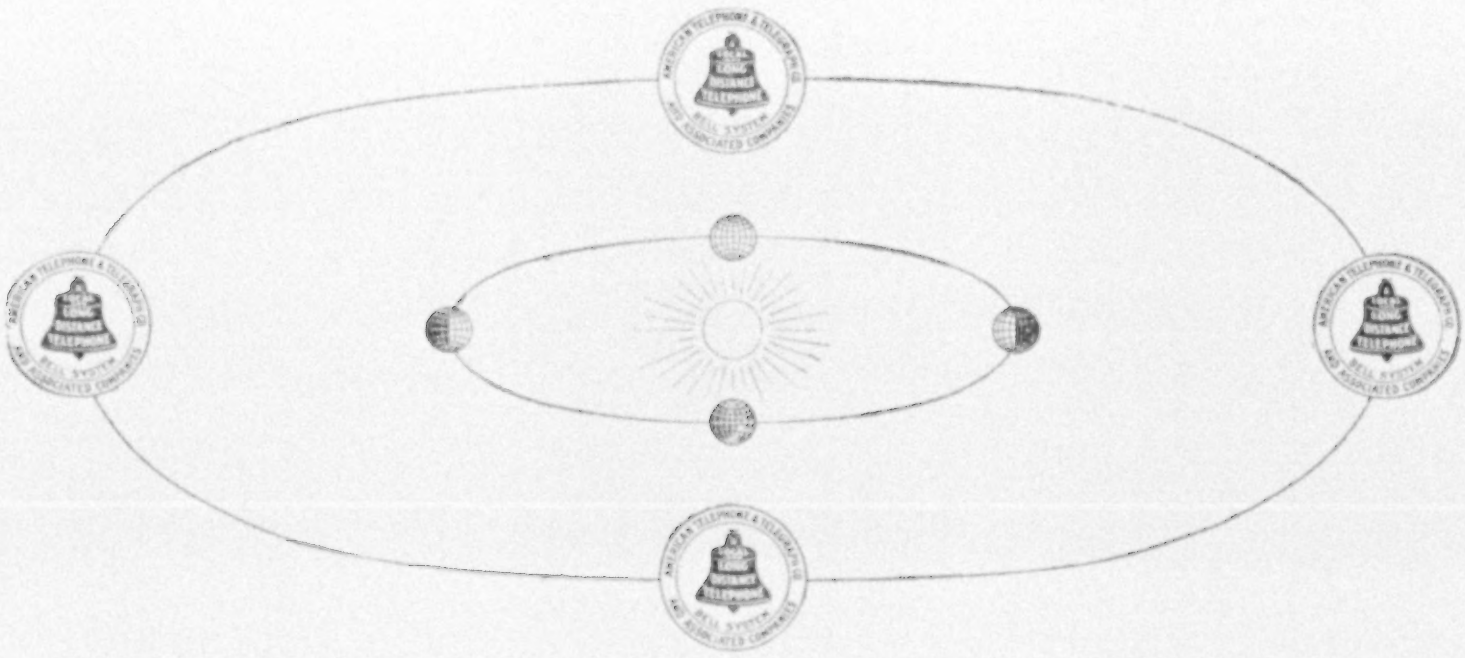

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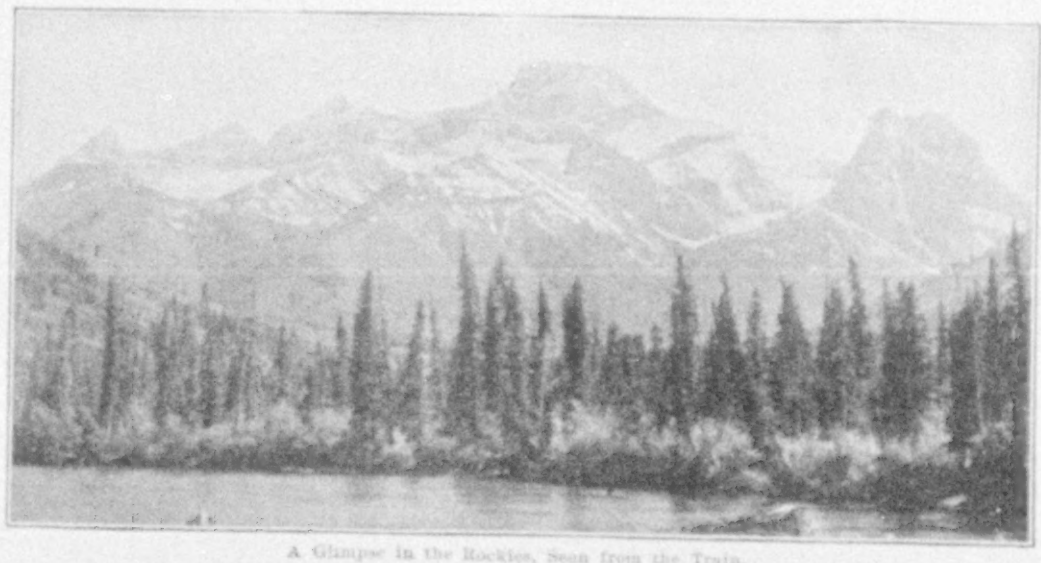

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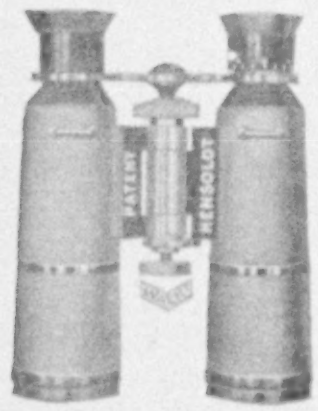

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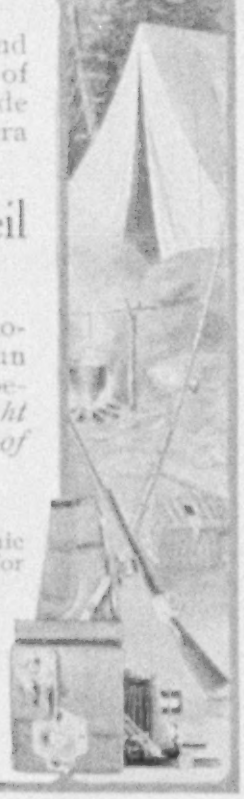

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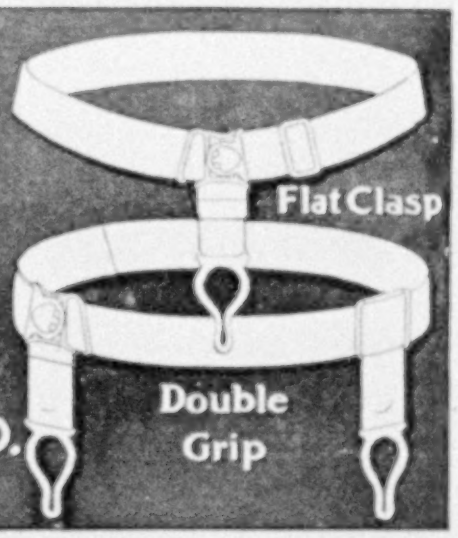

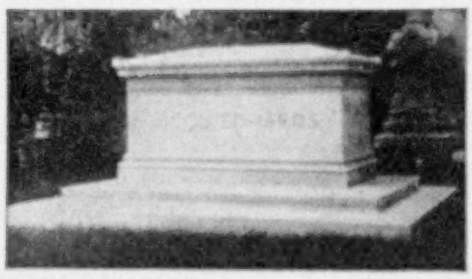

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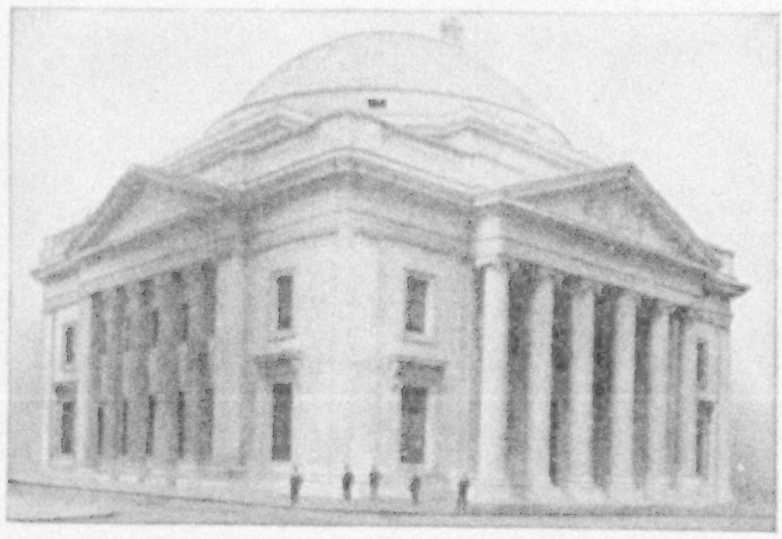

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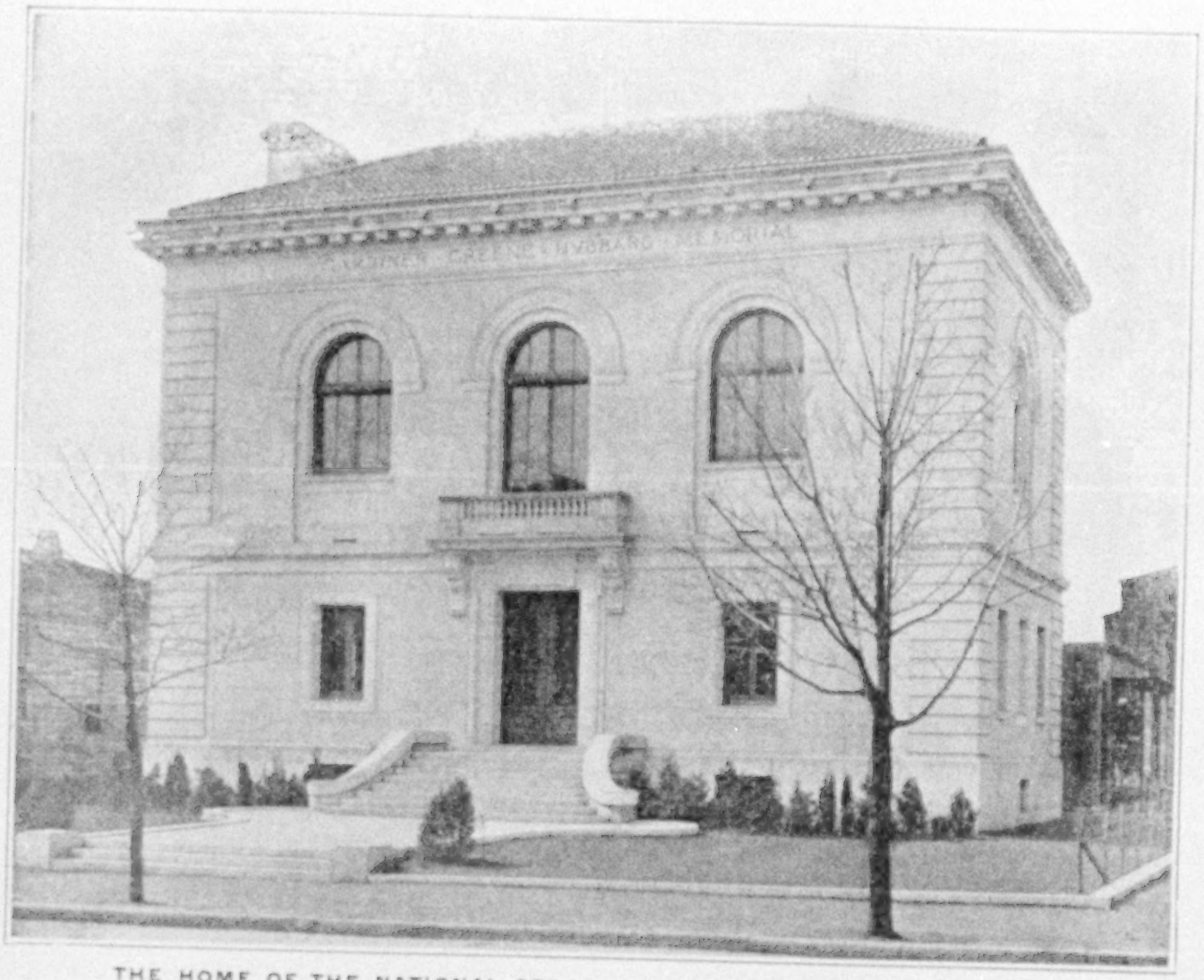

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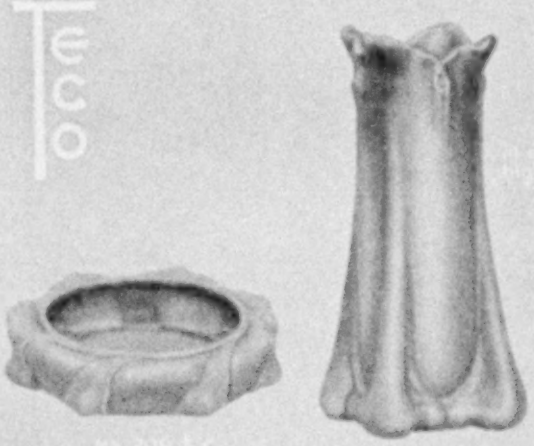

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